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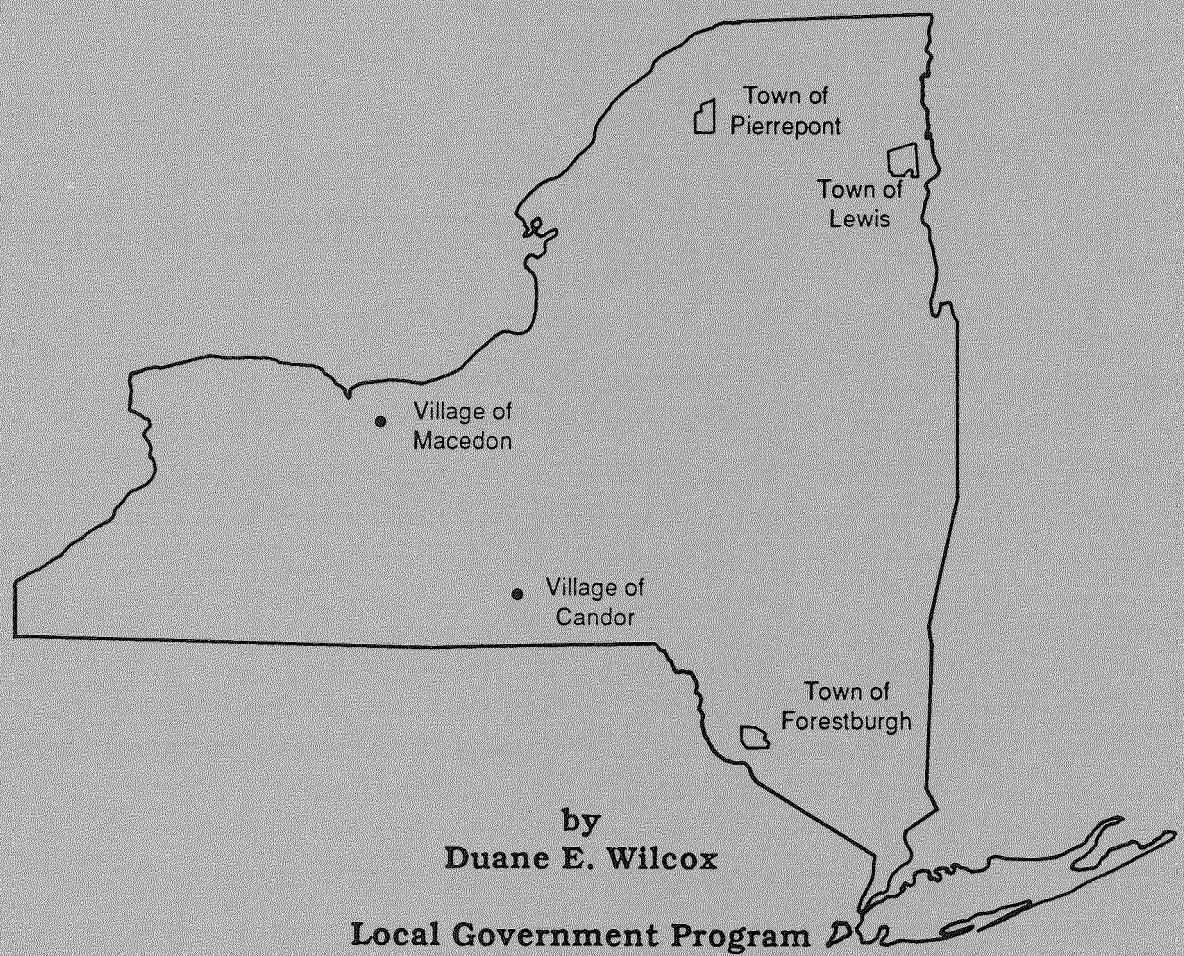
MICROCOMPUTERS AND SMALL LOCAL GOVERNMENTS IN NEW YORK: FIVE CASE STUDIES



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I. INTRODUCTION

This report provides five case studies of successful acquisition and use of microcomputers by three small towns and two small villages in New York State. These jurisdictions are as follows:

- The Village of Candor in Tioga County, 1980 population of 917;
- The Town of Forestburgh in Sullivan County, 1980 population of 796;
- The Town of Lewis in Essex County, 1980 population of 922;
- The Village of Macedon in Wayne County, 1980 population of 1,400; and
- The Town of Pierrepont in St. Lawrence County, 1980 population of 2,207.

The impetus for these case studies grew out of a survey of town microcomputer use undertaken by the Cornell Local Government Program in late 1985 and early 1986. This study indicated that not only were small towns making limited use of microcomputer technology, but that they lagged far behind large towns in doing so. In particular, of the towns from the smaller half of all towns responding to the survey (towns with 1980 populations of 2,635 or smaller), approximately 11 percent were using microcomputers. But the comparable percentage for the next largest 25 percent of towns (those with 1980 populations of 2,639 to 6,018) was 22 percent, and the comparable percentage for the largest 25 percent of towns (those with 1980 populations of 6,027 or greater) was 47 percent.[1] Villages were not included in the survey, but a reasonable assumption is that a similar survey of villages would have found the same general pattern.

It seemed highly unlikely that this low and lagging level of use of microcomputer technology by small jurisdictions indicated that it was not a generally cost-effective technology for them. Those conducting the research were familiar not only with available hardware and software, but also with a number of

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[1] Duane E. Wilcox, Microcomputers and New York Towns: A Survey Report, A.E. Research 87-29 (Ithaca, N.Y.: Local Government Program, Department of Agricultural Economics, Cornell University, November 1987), pp. 16-17.

instances of successful use of microcomputers by small towns and villages. These two bases of information suggested that, if properly selected, introduced, and used, microcomputer technology should prove cost-effective for the great majority of New York's small local governments. Both the particular advantages cited by those officials and employees of small local governments who were successfully using it as well as their enthusiastic endorsement of its appropriateness for comparable jurisdictions argued for this conclusion.

How, then, could this gap in use of microcomputer technology be explained? It seemed quite likely that the major explanatory factor was simply that, compared to the officials of large local governments, those of small jurisdictions were much less knowledgeable of the technology in general and how to properly select, introduce, and use it in particular. The researchers' interactions with local officials tended to indicate that those of small jurisdictions were significantly less knowledgeable concerning computer "jargon," how microcomputers work, the general process recommended for selecting software and hardware, the types of microcomputers, software, and applications most useful to local governments, problems that might arise and how to avoid or resolve them, etc. Of particular note was a tendency to significantly undercount and undervalue the benefits of microcomputer use by local governments. In large part, this knowledge disparity could be because most local governments with small populations are in rural areas; the opportunities for local government officials to learn about microcomputers, either formally or informally, have probably been much greater in urban and suburban areas.

This reasoning led to a decision to develop case studies that would help officials of small local governments learn more about the benefits and costs of microcomputer technology and how to properly select, introduce, and use it. Case studies seemed to be an appropriate way to pursue this educational goal because one of the preferred learning methods of local government officials is to investigate relevant experiences of other local officials. Case studies enable many local officials to learn in this fashion if they provide thorough descriptions of the experiences of other local officials in typical circumstances who tackled a problem facing many local governments. Lessons can be learned from case studies that tell of either successful or unsuccessful outcomes. But in this instance, it was thought that "success stories" would be more helpful.

To summarize, the objective guiding the preparation of the five case studies of this report was to help small local governments interested in possibly acquiring and using an initial microcomputer systems learn from the experiences of other small local governments that were already successfully using microcomputers.

II. SELECTING CASE-STUDY JURISDICTIONS AND DEVELOPING THE STUDIES

Selecting towns and villages for the case studies seemed appropriate primarily because the overwhelming majority of New York's small general-purpose local governments are towns and villages. In many states, the term "city" is used for jurisdictions with populations ranging from very small to very large. But only 1 of New York's 63 cities had a 1980 population of less than 5,000, and only three had 1980 populations between 5,000 and 7,500. On the other hand, 50 percent (466) of the state's 932 towns had 1980 populations of 2,635 or less, and 50 percent (280) of the state's 559 villages had 1980 populations of 1,698 or less. Not only were there no counties in 1980 with populations of comparable magnitude (the smallest had a 1980 population of 5,034), but the data processing needs of counties differ significantly from those of towns and villages.[2]

It was decided to do case studies of two villages and three towns. Time was available to do five case studies. Thus, it seemed appropriate to study two villages and three towns simply because this would provide a ratio of village case studies to town case studies (2:3) roughly equivalent to the ratio of total villages to total towns (559:932).

A number of criteria were used to select the towns and villages for the case studies:

Population rankings below the 1980 town and village median populations. -- The 1980 median population for villages was 1,698, and the median for towns was 2,637. Given these ceilings, an attempt was made to find jurisdictions suitable for study with 1980 populations placing them in the smaller 25 percent of towns (1980 populations of 1,434 or smaller) and the smaller 25 percent of villages (1980 populations of 791 or smaller). Two towns were selected that met this lower population condition: Forestburgh, with a 1980 population of 796, and Lewis (Essex County), with a 1980 population of 922.[3]

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[2] Office of the New York State Comptroller, Special Report on Municipal Affairs For Local Fiscal Year Ended in 1986, (Albany, N.Y.: 1987), pp. v, 60, 82, 162, and 230.

[3] Ibid., pp. v, 126, 138, 156, 162, 230, and 242. Another Town of Lewis is located in Lewis County.

Town and village ownership of computer systems. -- The 1985-1986 survey of town microcomputer use found that 76 percent of the towns reporting use of microcomputers owned them, 25 percent had "other-use arrangements," and 1 percent were using both arrangements. In addition, it seemed likely that most of the other-use arrangements would prove to be a transitional step to actual town ownership of microcomputer systems. Finally, it appeared that, in many instances, towns with other-use arrangements were not paying fair-market value for their microcomputer use; for example, more than half of the other-use arrangements involved machines owned by officials and employees that were also used for town purposes.[4] Case studies of microcomputers used under such arrangements might not give readers a good understanding of true governmental costs and benefits. For these reasons, it was decided that jurisdictions should be selected that owned the microcomputer systems being used.

No evidence of special advantages in acquiring and initiating use of microcomputer technology. -- It was hoped that the case studies would produce reactions from readers such as "If they can do that, then we can probably do it in our town, too" rather than "No wonder they succeeded -- look at the special advantages they had!" Thus, it seemed appropriate to choose jurisdictions that were not favored in some unusual way. An example of a special advantage would be a skilled private-sector computer programmer as village mayor who provided the leadership for acquiring and initiating the use of a microcomputer system.

Significant use of the microcomputer system. -- It was presumed that local officials would find the case studies more useful if each jurisdiction studied was using microcomputer technology for a significant number of applications. A jurisdiction was considered to have met this criterion if a prospective interviewee could easily list seven or more applications during a telephone interview. At least two of these applications had to be major applications, such as water billing and general ledger.

Successful acquisition and use of microcomputer technology.-- Lessons can be learned from case studies of unsuccessful efforts by small local governments to use microcomputer technology. But it seemed very likely that those to be learned from "success stories" were both more numerous and more valuable. Thus, potential interviewees were asked during the telephone interview whether they thought that, from a broad perspective, the benefits of microcomputer acquisition and use outweighed the costs for their jurisdictions. The subsequent interviews for the case studies were designed to help the interviewees give more

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[4] Wilcox, Microcomputers and New York Towns: A Survey Report, pp. 19-21.

considered answers to this question. But, for the purposes of selecting the five jurisdictions, this criterion was considered satisfied if a prospective interviewee responded "Yes" with considerable conviction.

Three sources of information were used to identify towns and villages that might meet the foregoing criteria. The first was the information on microcomputer use by particular towns gathered during the 1985-1986 town microcomputer use survey. The second was the information gained from the researcher's interactions with participants in various training efforts. The third source of information was "leads" furnished by a village official working part-time with a local government software firm and a consultant who had been involved in developing and marketing a local government software package.

As indicated previously, telephone interviews were then used to gather the final data used for selecting the five jurisdictions for the case studies. These interviews with the principal microcomputer operators in the identified towns and villages were used to determine whether their jurisdictions met the criteria explained above (other than the population criterion) and whether these operators would be willing to help with the case studies. These data were then used to select the most promising towns and villages for the case studies. For example, if a choice had to be made between two qualifying villages, other things being equal, the one with the greater number of microcomputer applications was chosen.

Two questionnaires were used during the case study interviews. The questions for the primary questionnaire were drafted on the basis of the researcher's knowledge of microcomputer hardware and software, his previous interactions with officials of local governments who were using or were interested in using microcomputer technology, and his review of the twelve case studies of microcomputer use by cities prepared by Donald Norris and Vincent Webb.[5] The second questionnaire was the longer of the two questionnaires used for the 1985-1986 survey of town microcomputer use. One section of this questionnaire provided an extensive checklist of particular local government microcomputer applications along with blank spaces for listing applications not specifically identified in the checklist. The interviewees were referred to this checklist to help them answer the question on the primary questionnaire that asked them to identify microcomputer applications in their

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[5] See Donald F. Norris and Vincent J. Webb, Microcomputers in City Hall: Case Studies of Their Uses and Effects (Omaha: Center for Applied Urban Research, University of Nebraska at Omaha, 1987).

jurisdictions. (Copies of these questionnaires are available upon request.)

For each jurisdiction selected for a case study, a multi-step process was used to gather relevant information and to use it to develop the case study. Before an interview with the principal operator, this person was sent three pages of the primary questionnaire along with a request to answer the questions on those pages before the interview. These questions asked the operator to list the jurisdiction's hardware components and software products and to provide their costs. Receipt of these questions before the interview allowed the operator ample time, if necessary, for searching the files or consulting other persons for the answers. The interview itself took two to three hours. In addition to answers to questions on the two questionnaires, information was sought on which to base a brief statement of the town or village's governmental structure and services for the case study. After the interview, a draft of the case study was developed and sent to the interviewee for review. A subsequent telephone conversation was used to identify changes that needed to be made to produce an accurate final draft. These changes were subsequently made along with final editorial changes, thus producing the case studies as they appear in this report.

III. DISCUSSION OF SUMMARY POINTS

A discussion of summary points should prove useful to readers. By themselves five case studies do not provide evidence of widespread patterns. But trying to find commonalities in the five experiences and commenting on them should help local government officials who wish to learn from them. Such commonalities take on additional importance when they conform with conclusions from other case studies or with conclusions documented by systematic attempts to identify patterns and trends, such as the 1985-1986 town microcomputer use survey. Where appropriate, these agreements will be pointed out in the following comments.

The five jurisdictions purchased their microcomputer systems with specific applications in mind. In all cases, the impetus to acquire a system appeared to begin with what Donald Norris terms "general reasons," that is, those that "do not identify specific uses or tasks," such as a general concern for productivity.[6] But the process quickly became focused on specific applications--for example, budget preparation and maintenance of the general ledger.

The common elements in the acquisition experiences of the five jurisdictions are the following:

- Methodical gathering and evaluation of relevant information on microcomputer technology in general and specific hardware and software products in particular;

- General conformity with the steps commonly found in different versions of recommended processes for acquiring a microcomputer system;[7]

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[6] Donald F. Norris, Microcomputers and Local Government, 2nd ed. (Washington, D.C.: International City Management Association, 1986), p. 93.

[7] Many knowledgeable parties have explained different processes for acquiring microcomputer systems, but these processes tend to be more alike than different. In greatly simplified terms, the general theme is as follows: choose the tasks to be computerized, choose the software to do these tasks, and then select the hardware that will run this software.

- Individual leadership, that is, the willingness of an individual to seek out and evaluate relevant information, report to others, ask for their advice and decisions, and, in general, keep the acquisition process moving forward; and

- Overall satisfaction with the decisions made during the acquisition process.

All five jurisdictions conformed to the general pattern with respect to types of hardware being used. The 1985-1986 town microcomputer use survey found that IBM PC and IBM PC-compatible microcomputers were the dominant types of machines being used by towns.[8] All five of the case-study jurisdictions were using these types of microcomputers.

The experiences of the five jurisdictions with microcomputer repair needs were much like what Norris and Webb found in their case studies of twelve cities, namely, "the hardware worked reliably and effectively. . .although not without occasional difficulty."[9] Candor and Forestburgh had not experienced any hardware repair needs. Lewis had experienced only one problem, namely, a failed chip that required that the microcomputer be returned to the factory for two weeks for repair. Macedon had experienced hard disk failures and a problem with one of its printers that was quickly resolved by a service person. The supervisor's clerk in Pierrepont had been unable to get the town's printer to perform as promised and was quite dissatisfied with it, but had not experienced other hardware problems.

The satisfaction ratings for their hardware chosen by the interviewees reinforce the foregoing conclusion. On a one-to-five scale with one representing "very dissatisfied" and five "very satisfied," five was chosen by the interviewees from Candor, Lewis, and Forestburgh. The clerk-treasurer in Macedon chose four. The supervisor's clerk in Pierrepont chose five for all of its hardware except the printer, for which he chose a separate rating of one.

As did the Norris and Webb case studies, those provided here suggest that hardware maintenance contracts for microcomputers generally are not worthwhile for local governments. Ten of the twelve cities studied by Norris and Webb "reasoned that maintenance policies were excessively expensive considering the reliability and ease of repair of microcomputer equipment. . . .

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[8] Wilcox, Microcomputers and New York Towns: A Survey Report, pp. 34-35.

[9] Norris and Webb, Microcomputers in City Hall: Case Studies of Their Uses and Effects, p. 7.

Experience proved these cities correct."[10] The actual costs of the repair needs reported by the five towns and villages of these case studies probably fall far short of what is commonly paid for maintenance contracts. Even if a microcomputer needed repeated and costly repairs, it would generally be cheaper over the span of a few years simply to replace it than to pay for a maintenance contract. A good case for a "quick-response" maintenance contract can be made if a microcomputer is used for tasks that must be performed continuously or that have strict deadlines. But these needs could be met by a "backup machine," an alternative that was available to three of the case-study jurisdictions despite their small sizes. While the purchase of a backup machine by a small local government might seem expensive, as noted previously, paying for a maintenance contract for a few years is generally even more expensive; in addition, a second machine would be available for use. A compromise strategy for those still not convinced by these arguments might be to purchase a maintenance contract for the first year of microcomputer ownership and then not renew it if significant repair costs have not been experienced during this year.

Lewis, Pierrepont, and Macedon purchased various "stand-alone" software products, that is, products from different software developers that were not specifically designed to work with one another. Only one of these products -- the Informatics general-ledger package purchased by Macedon -- was designed specifically for use by New York general-purpose local governments. One other product -- the general-ledger software used by Lewis -- was a small-business software product that had been modified for local government use. None of the three governments was paying for software support contracts for their software products.

Candor and Forestburgh used a contrasting strategy in selecting software. The great bulk of the expenditures for software incurred by each of these jurisdictions was for "integrated financial-management software packages" designed specifically for use by New York general-purpose local governments. These packages consist of various software "modules" from a single developer that enable a user to enter and manipulate data in one module and then easily transfer the results to another module (for example, from a budget-preparation module to a general-ledger module). Various combinations of the modules can be purchased initially, depending on the specific needs of a jurisdiction and its available funds; others may be purchased later as additional needs develop, funds become available, or both of these conditions are met. Each module, however, tends to be much more expensive (often five to ten times more expensive) than a software product for the same purpose

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[10] Ibid.

designed for a broader group of users than New York general-purpose local governments, such as a general-ledger package for small businesses. In addition, Candor and Forestburgh were expending funds annually for software support agreements with the vendors of these integrated software packages.[11] These agreements entitled them to assistance with the software products acquired from these vendors, updated versions of the financial-management software products when these became available, and training for use of the updated products and for new microcomputer operators.

Despite the use of these two contrasting strategies for software selection, the overall software ratings provided by the five interviewees were comparable. On a one-to-five scale with one representing "very dissatisfied" and five "very satisfied," the interviewees in Lewis, Pierrepont, and Macedon provided overall software ratings of five, four, and five, respectively. Similarly, the interviewees in Candor and Forestburgh provided ratings of five and four, respectively.

What these comparable ratings suggest is that either strategy can produce satisfactory results. While the strategy used by Candor and Forestburgh usually results in much higher software costs than the strategy used by the other three jurisdictions, a much more valuable quantity of benefits may justify the higher costs. Thus, one important factor in choosing one strategy over the other may simply be the amount that a jurisdiction is willing or can afford to invest in software. Of course, in using either strategy, a local government should pay close attention to the quality of the products and services that it is considering, the competitiveness of their prices, and their appropriateness for the jurisdiction's needs. If not carefully implemented, either strategy may produce unsatisfactory results.

The five jurisdictions generally conformed with general patterns with respect to word processing, spreadsheet, and database management software products. These three types of software products are those most commonly purchased by microcomputer users. They also constituted three of the four types of software products most widely available among the towns using microcomputers that responded to the 1985-1986 town microcomputer use survey.[12] Three of the case-study jurisdictions had purchased all three of these types of products, and each of the other two had purchased two of them.

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[11] The Candor agreement also covered hardware maintenance.

[12] Wilcox, Microcomputers and New York Towns: A Survey Report, pp. 39-41. The fourth type of software was financial-management products.

All five case-study jurisdictions had done at least some applications development. This ranged from setting up simple word processing formats that were used many times to more complicated applications, such as spreadsheet templates for budget preparation and a program for tracking earnings from village investments and distributing the interest earnings from a single certificate of deposit to a number of funds.

Four sources of funds were used for the initial purchases of hardware and software. Two of the jurisdictions used regular revenues, one used a bank loan with a five-year repayment period, another used a bond anticipation note that was repaid without the issuance of a bond, and the fifth used regular revenues to purchase two Apple systems that were later sold to provide funds for buying replacement IBM systems.

All of the jurisdictions used regular revenues in the years after they first acquired the systems to pay for such things as supplies, additional software products and hardware components, and hardware maintenance and software support contracts.

In terms of most common areas of applications, the five case-study jurisdictions again generally echoed the findings of other studies. Norris notes that two surveys conducted in the early 1980s found that local governments used microcomputers primarily for word processing and financial management.[13] The 1985-1986 town microcomputer use survey found that central-staff financial management applications and central-staff word processing applications were the most common areas of applications. Indeed, beyond these two areas, there were no common areas of applications.[14] Of a total of 123 applications reported by the five case-study jurisdictions, 51 were central-staff word processing applications and 43 were central-staff

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[13] Norris, Microcomputers and Local Governments, p. 37.

[14] Wilcox, Microcomputers and New York Towns: A Survey Report, pp. 48-49. These applications are financial-management and word processing applications generally undertaken by central-staff (elected and appointed) that involve town operations as a whole or that are commonly done by such persons on behalf of a number of particular functions and service areas. Examples are the preparation of a town budget by the budget officer and the preparation and indexing of minutes for meetings of the board of trustees by the village clerk-treasurer.

financial-management applications.[15] The next most common applications were applications involving license and permit records and management (11 applications) and those involving real property assessments and taxes (10 applications).[16]

Although there was considerable variability in the applications that the interviewees considered most valuable, all of them mentioned the saving of personnel time as a criterion for their choices.

All five jurisdictions completed their first useful products (for example, a budget printout) within relatively brief periods of time after acquisition of their systems. For Macedon, this was one day; for Forestburgh, less than a week; for Pierrepont, one week; for Lewis, one month; and for Candor, six weeks.

The differences in length of time depended in large part upon particular circumstances and choices of applications. Lewis, for example, acquired its microcomputer at a time that was not opportune for immediately initiating the tasks that the supervisor wished to do first. Candor began with a time-intensive major application (water billings). On the other hand, the town supervisor in Forestburgh had already been using his own computer for applications that he was able to duplicate on the town's system within a week after its purchase.

None of the case-study jurisdictions hired a new person solely to be a microcomputer operator or a new person with proven skills in operating a microcomputer. In all five cases, persons already elected or appointed to town or village positions became the operators. In Candor, however, the village board did select a person for clerk-treasurer who indicated her willingness to

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[15] The total of 123 does not refer to 123 different applications. Rather, if four jurisdictions reported "indexing of minutes" as an application, this constituted 4 of the 123 applications.

[16] Pierrepont and Forestburgh were partial exceptions to this general situation. The most numerous areas of applications in Pierrepont were central-staff financial-management applications (5) and real property assessment and tax applications (4). The most numerous areas of applications in Forestburgh were central-staff word processing (15), central-staff financial-management (8), and license and permit records and management (8). In both cases, these partial variations from the overall pattern of the five jurisdictions reflected the particular responsibilities of the principal microcomputer operators -- the combined supervisor's clerk and chairman of the board of assessors in Pierrepont and the town clerk in Forestburgh.

learn to use a microcomputer if one were acquired at a later date, as it was.

In four of the five jurisdictions, who the operators were and what the microcomputers were used for seemed to be determined in large part by who provided leadership in the acquisition process. In Pierrepont, for example, the person holding the two positions of supervisor's clerk and chairman of the board of assessors played a leading role in the acquisition process. He subsequently became the chief microcomputer operator and, of course, used it primarily to help fulfill his two sets of responsibilities. In Lewis this leading role was played by the town supervisor. He learned to use the microcomputer to help with a number of his responsibilities and also made certain that his bookkeeper learned to use it. The lesson would appear to be that "the person who takes the initiative in pursuing microcomputer acquisition is likely to reap the benefits first" -- certainly not an unfair outcome.

The one common element in terms of microcomputer training was the importance of informal learning methods. The amount of formal training received by the microcomputer operators varied considerably, from none for the primary operator in Pierrepont to perhaps 60 hours for the supervisor's bookkeeper in Lewis. But all of the operators had used such methods as studying hardware and software manuals, working through software tutorials, reading computer magazines and books, experimenting with the system ("trial and error"), and seeking the assistance of another town or village microcomputer operator. All of those interviewed assigned major importance to these learning methods.

None of the five case-study jurisdictions had a formal management policy concerning the acquisition and use of microcomputer technology. Norris pointed out that the existence of such policies in local governments was quite unusual and concluded that this might be a major improvement that local governments could make in the use of this technology.[17] All five jurisdictions had made decisions on matters that could be covered by such a policy statement, but no one in these jurisdictions had proposed that one be adopted. It seems likely that even for jurisdictions with only one or two microcomputers, such as those studied for this report, at least some gains would probably be achieved through the process of discussing, agreeing upon, and

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[17] Norris, Microcomputers and Local Government, p. 90. Examples of matters that Norris thought might be usefully covered in a formal management policy were the maximum amount of funds to be spent for a particular hardware component; the types of hardware, operating systems, and applications software to be purchased; and rules that prevent conflict over system use and unnecessary duplication of hardware and software. Ibid., p. 90.

attempting to abide by a formal management policy. The gains might increase significantly for a local government with a number of microcomputers.

The direct users of the data and documents developed on the microcomputer systems of the five jurisdictions were not limited to only those operating these systems. Rather, they included many others: other officials and employees within the town and village organizational structures; residents interested in their personal affairs and concerned about town and village issues; and representatives of private and other public organizations, such as private attorneys and county officials.

The primary questionnaire for the case-study interviews asked the five interviewees to review lists of potential positive and negative effects of microcomputer use and to identify those experienced in their particular jurisdictions. These effects were formulated on the basis of the researcher's experience in working with local governments using microcomputers and his reading of relevant literature. The list of possible positive effects included 20 particular effects and space for writing in still other positive effects. Similarly, the list of possible negative effects included 24 particular effects and space to write in additional negative effects. The complementary objectives were to draw upon prior research and experience to list as many particular potential effects as possible and to allow the interviewees to add others not included in the lists.

The overall picture that emerged from the effects reported by the interviewees in the five jurisdictions should be of interest to other local officials trying to learn from these case studies. Tables 1 and 2 help present this picture by summarizing the positive and negative effects reported by the five interviewees.[18] As indicated in these tables, the positive effects reported greatly outnumbered the negative effects reported. In addition, all of the interviewees stated that the positive effects greatly outweighed the negative effects in terms of overall <u>importance</u>. Finally, the two tables show that eleven positive effects and two negative effects were reported by all five of the interviewees. These responses <u>suggest</u> that these particular effects are quite likely to occur in other small jurisdictions that properly select, introduce, and use microcomputer technology.

(Text continued on page 20.)

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[18] The effects are stated here as they were stated on the primary questionnaire. Some of them are stated somewhat differently in some instances in the case studies due to a jurisdiction's particular circumstances (for example, only one microcomputer operator rather than the two or more assumed in these statements).

Table 1. POSITIVE EFFECTS OF MICROCOMPUTER USE IN THE FIVE CASE-STUDY JURISDICTIONS

Possible positive effects	Number of interviewees reporting this effect
1. Use of computers owned by outsiders has decreased, resulting in increased control over data processing.	0
2. Accuracy of work has increased.	5
3. Time has been saved.	5
4. Time has been saved and is used to do tasks that there was no time to do before.	5
5. Revenues have increased.	1
6. Costs have been avoided (for example, the need for an additional clerical person was eliminated).	3
7. Expenses were actually reduced (for example, a position was eliminated from the payroll).	3
8. It is easier to do the tasks done on the microcomputer than it was to do them manually.	5
9. Work became more enjoyable (or less tedious).	5
10. Procedures for performing certain tasks have been improved--the software process is better thought out and better suited to the task than the previous manual process.	4
11. Paper storage is not growing at as fast a pace as it would have without use of the microcomputer.	1
12. Paper storage is actually less than before microcomputer use began.	0

Table 1 (continued).

Possible positive effects	Number of interviewees reporting this effect
13. Sharing of information among officers and employees has increased.	5
14. Better information is made available for decision-making.	5
15. Decision-makers expect more and better information.	5
16. Work is completed on a more timely basis.	3
17. The appearance of documents has been improved.	5[a]
18. The microcomputer operators have learned new skills.	5
19. The microcomputer operators feel more positively about their jobs.	5
20. One or more officers or employees <u>often</u> are asked to assist less skilled microcomputer users--and consider this a positive effect.	2
21. Other positive effects.	3[b]

[a] Included in the five is the one interviewee who reported that the quality of <u>some</u> documents had improved while the quality of others had decreased.

[b] Two jurisdictions reported more capability to provide personalized service to residents and one to provide such service to both residents and employees.

Table 2. NEGATIVE EFFECTS OF MICROCOMPUTER USE IN THE FIVE CASE-STUDY JURISDICTIONS

Possible negative effects	Number of interviewees reporting this effect
1. Workloads increased significantly <u>during conversion</u> to use of the microcomputer.	5
a. If so, existing personnel handled this increased workload.	5
b. If so, temporary personnel were added during the conversion period.	0
2. Workloads increased <u>permanently</u>.	0
3. Job frustration increased <u>temporarily</u> for those learning to operate the microcomputer and/or implement its use.	3
4. Microcomputer operators are more frustrated with their jobs than before -- even after the initial learning period and/or implementation period.	0
5. Job pressures and stress increased for microcomputer operators.	0
6. Work became more difficult for microcomputer operators.	0
7. Work became less enjoyable for microcomputer operators.	0
8. Serious disagreements among microcomputer operators have developed over amount of time spent working on the microcomputer, when it is available for use, location, etc.	0
9. Microcomputer operators complain about physical problems resulting from microcomputer use (eye strain, backaches, etc.)	2

Table 2 (continued).

Possible negative effects	Number of interviewees reporting this effect
10. Incorrect information often has been produced and used for decisions.	0
11. A lower volume of work is produced.	0
12. Work is often completed on a less timely basis than it was with manual methods.	0
13. Costs have increased; productivity has not increased proportionately.	0
14. The microcomputer saves time, but the time saved is not used to benefit the jurisdiction -- employees have more "slack" time.	0
15. Revenues decreased.	0
16. One or more officers or employees developed serious and persisting cases of computerphobia -- serious anxiety about or fear of using the computer, refusal to use it, etc.	0
17. One or more employees quit or retired because of the microcomputer.	0
18. The quality of documents has decreased.	1[a]/
19. There is serious and unnecessary duplication of paper files and computer files.	0
20. There is less capability to provide personalized service to residents.	0
21. Officers and employees were forced to learn to operate the microcomputer and still resent this.	0

Table 2 (continued).

Possible negative effects	Number of interviewees reporting this effect
22. One or more officers or employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a negative effect.	0
23. Other negative effects.	2[b]/

[a]/ This number represents the one interviewee who reported that the quality of <u>some</u> documents had decreased.

[b]/ Interviewees from two jurisdictions reported criticism from a few residents who claimed that the purchase of microcomputer technology was not a wise use of funds. One of these interviewees also noted that in his case he loses some detailed knowledge of certain aspects of town operations when he performs tasks by computer rather than manually.

The five interviewees were asked to identify the most important problems or limitations that their jurisdictions had experienced in using microcomputers. Two of the interviewees reported no really important problems or limitations. Two noted their limited success in identifying software developed specifically for use by small jurisdictions that could be purchased at reasonable prices. One of these interviewees also noted the limited amount of time she could find to develop her own programs for her village and the inadequate number of programs available from state agencies for use by local governments. The fifth interviewee noted two problems. One was the somewhat difficult transition in use of the microcomputer system from the supervisor who had played the leading role in selecting it to his successor who was initially quite unfamiliar with it; the second was the refusal by two state agencies to accept reports that she generated on the microcomputer.

The last question of the primary questionnaire asked the interviewees to select statements to describe the overall costs and benefits of microcomputer acquisition and use for their jurisdictions. Specifically, they were asked whether the benefits of acquiring, learning to use, and using their microcomputer systems were (1) much lower than the costs; (2) significantly lower than the costs; (3) about equal to the costs; (4) significantly greater than the costs; or (5) much greater than the costs.

The placement of this question at the end of the questionnaire was not accidental. The previous 35 questions engaged the interviewees in quite thorough examinations of their jurisdictions' experiences with microcomputers. This should have prepared them to make "considered judgments" on costs and benefits in response to the last question.

It was conceivable that this detailed review could have led one or more of the interviewees to reverse the judgments that they had made when they were interviewed during the process of selecting case-study jurisdictions. As noted earlier, one of the criteria for selecting jurisdictions was successful acquisition and use of microcomputer technology. For a jurisdiction to meet this criterion, the prospective interviewee had to render a judgment with considerable conviction that for her or his jurisdiction the benefits outweighed the costs. Obviously, such judgments, solicited during relatively brief telephone calls, could have been of an "off-the-cuff" nature and therefore subject to change after the more careful consideration that occurred during the actual case-study interviews.

In fact, however, none of the five interviewees reversed his or her earlier judgment at the conclusion of the interview. Two of them decided that the benefits were "much greater than the costs" (the most positive statement), and three decided that the

benefits were "significantly greater than the costs" (the next most positive statement). These overall evaluations should be very encouraging to officials and employees in small towns and villages that are not yet using microcomputer technology, but are considering whether it would be worthwhile to do so.

IV. MICROCOMPUTER ACQUISITION AND USE IN THE VILLAGE OF CANDOR

Case-study interviewee: Gina Currie, Candor Clerk-Treasurer. Interview conducted in May 1988.

Background: Village of Candor

Candor is a small village in Tioga County in New York State's "Southern Tier." The village's 1980 population was 917, giving it a population rank of 391 among the 555 New York villages in existence in 1980.[19] Current population probably is approximately the same. The Candor Central School District, encompassing the village and a large surrounding area, is the largest employer in the village. Many residents commute to jobs in the nearby Ithaca and Owego areas, 29 and 11 miles away, respectively.

The village has a small number of officers and employees. In addition to a mayor and the other four members of the village board of trustees, there is a half-time clerk-treasurer, an attorney "used as necessary," a village justice and an acting justice, a code enforcement officer, and one full-time employee who serves as water plant operator, chief of public works, and policeman. Temporary workers are hired occasionally.

The village serves its residents through a number of facilities and services. The village owns and operates a water system; sewage disposal is handled by private septic systems. A library building is owned and maintained by the village; a separate library organization operates the library. The village maintains its streets and removes snow and ice from them; it also provides necessary drainage facilities and service. The village owns two fire trucks operated by the volunteer fire company and makes a large annual donation to the company. The fire chief is elected by the fire company and is currently the village employee who serves as water-plant operator, chief of public works, and policeman. The village is not zoned, but its code enforcement officer does enforce the state building and fire prevention code, the village's unsafe-buildings code, a junk-car ordinance, and

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[19] Office of the New York State Comptroller, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1980, (Albany, N.Y.: 1981), pp. v and 148.

parking and sidewalk regulations. The village justice and acting justice run a village court. The village uses the Town of Candor's assessment roll to levy taxes on village real property.

The Process of Selecting the System

The primary reason that the village board members began to investigate acquisition of a microcomputer system was their hope that this would allow them to reduce the village office staff from one and one-half full-time positions to a half-time position. One person had served as a half-time clerk-treasurer, and another had served as a half-time deputy to the clerk-treasurer and also as a half-time water billing clerk. Both employees had opposed acquisition of a microcomputer. When they left village employment, the village board hired a half-time clerk-treasurer with a willingness to learn to use a microcomputer. With the aid of a microcomputer, she was expected to take over the responsibilities of the two former employees.

The village board and its new clerk-treasurer approached the task of selecting a system in a methodical but also evolving fashion. They first identified two time-intensive tasks that they wished to consider computerizing, namely, water and tax billing. They decided that costs had to be carefully considered, although they did not attempt to agree on a ceiling price. They also agreed that the amount and quality of training provided with the system should be a high-priority consideration. They then began to call vendors to arrange for interviews and demonstrations. Seven vendors were considered, and the amount that the village was willing to pay as well as additional important considerations evolved as a result of the interviews and demonstrations. These additional considerations included the extent to which a vendor specialized in municipal systems, a vendor's experience with local governments, whether a vendor could provide existing rather than "to-be-created" software, the vendor's seeming attentiveness to the village's needs, and the vendor's ability to provide prompt and helpful support to resolve problems. The number of tasks that the village decision-makers wished to computerize also expanded significantly as they became more familiar with available software products. References were requested and were contacted. The final decision was to purchase a system from Associated Computer Products, a Syracuse firm that specializes in local government computer systems. This was done in June 1987.

The village worked through this process without help from "outside experts." It did have, however, one board member who was very familiar with computer technology because of his employment at an International Business Machines plant in nearby Owego. He was a active participant in the discussions, but

refrained from voting on which system to purchase because IBM was one of the prospective vendors.

When asked "What do you think you should have done differently in selecting hardware and software," the village clerk-treasurer responded that she was very satisfied with the selection process used by the village.

Hardware, Software, and Support Arrangements

The hardware was purchased through Associated Computer Products. The hardware consists of a Sperry computer, keyboard, and monitor, an Okidata printer, and a Data Shield power regulator battery to provide voltage regulation and a backup source of power. The computer has one floppy disk drive, a 20-megabyte hard-disk drive, and an internal modem, which had been tested but not used for village purposes at the time of the interview. A computer desk and printer stand were also purchased.

The software consisted mostly of standard products developed by Associated Computer Products that were customized to Candor's needs. They included modules for water and tax billing, general ledger, accounts payable, accounts receivable, payroll, and fixed assets. The vendor also included a word processing package and a database manager. At the village's request and at no extra charge, the vendor developed software that documents the components of the village water system and its operating instructions. This gave the village a record of the knowledge of the system previously known only by the retiring water plant operator.

The source of the funds used to purchase the microcomputer system was a loan from the local bank with which the village does business. The total cost of the new equipment was $4,600, and the total cost of the software, including training, was $10,270. The total of $14,870 is being repaid over a five-year period.

The village has a contract for hardware maintenance and software support with the vendor. For $1,800 annually, the village is entitled to call the vendor to resolve hardware and software problems, to receive updates of the vendor's software products, and to receive instruction to operate the updated software. The village has experienced a problem requiring help from the vendor on only one occasion, and this was resolved promptly. The clerk-treasurer, the operator of the system, attributes much of the record of trouble-free operation to excellent training by the vendor when the system was first acquired. Several updates of the vendor's software products have been provided, and the vendor has often stopped by and provided

suggestions for improving use of the system. The vendor's policy is to respond to a call for assistance no later than a half-day after the call.

Microcomputer Applications in Candor

The list of microcomputer applications identified by Candor's Clerk-Treasurer was quite lengthy. It consisted of the following:

Real property assessments and taxes:

- Maintenance of parcel information.
- Establishing assessed values.
- Printing assessment and tax rolls.
- Printing tax bills.
- Tax collection.
- Preparing assessor's annual report.

Streets and highways

- Scheduling of equipment maintenance.
- Parts and equipment inventories.

Water supply service

- Billing.
- Recording payments.
- Preparation of reports.
- Documenting location of gates and streets for turning on and shutting off water service.

License and permit records and management

- Building permits.
- Liquor licenses.
- Licenses for games of skill and chance.

Personnel

- Personnel records for village officers and employees.

Risk management

- Insurance and other risk management records.

Central-staff financial management[20]

Budget preparation by the budget officer (the clerk-treasurer).
General ledger.
Purchase orders.
Accounts payable.
Monthly abstracts for review by the village board.
Check-printing, accounts payable.
Accounts receivable.
Cash receipts.
Payroll calculations.
Payroll check-printing.
Payroll reports.
Fixed-asset accounting.
Monthly financial reports to the village board.
Year-end closing of books.
Annual financial report to the State Comptroller's Office.

Central-staff word processing[21]

Maintenance of membership lists of appointed boards and committees.
Preparation of agenda for meetings and hearing.
Preparation of minutes for boards and committees.
Indexing of minutes.
Preparation of proposed local legislation (resolutions and local laws).
Status of proposed local legislation.
Preparation of public notices to be posted, published, or mailed.
Indexing of approved local legislation.
Maintenance of mailing lists and production of mailing labels.
Production of form letters.
Preparation of bid specifications.
Preparation of reports for the village governing board, state agencies, etc.
Preparation of newsletter for village residents.
General typing and filing.

When asked which of the above applications were the most valuable for the village, the clerk-treasurer responded, in order

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[20] This term is defined in footnote 14 on page 11 of this report.

[21] This term is defined in Footnote 14 on page 11 of this report.

of importance, water billing, accounts payable, and real property tax billing. The amount of time she has been able to save by doing these tasks by computer was an important criterion for these ratings.

The choice of initial applications was influenced both by the time within the village's fiscal year when the microcomputer was purchased and a strategy of beginning with applications that could greatly save time for the clerk-treasurer. When the system was acquired on June 18, 1987, one labor-intensive clerical task, the preparation and mailing of property tax notices, had just been completed, and work on another, preparation of the annual financial report, was already underway by the "pencil-and-calculator" method. But the preparation and mailing of water bills, another task demanding a heavy input of clerical time, had to be done during July. Thus, water billing was the first application undertaken. By August 1, the water bills were in the mail.

Once water billing was computerized, the decrease in the amount of time the clerk-treasurer had to spend on this task gave her time to learn to use the microcomputer for other tasks. The same concern for saving her time led to the computerization next of two other time-intensive tasks, accounts payable and accounts receivable.

How much personnel time was saved by computerizing the water billing? The clerk-treasurer estimated that the former water-billing clerk had spent approximately 130 hours per calendar quarter doing the water billing after the meter readings were given to her. With the microcomputer, 2 hours of the clerk-treasurer's time produces the billings, ready for delivery to the post office.

Real property tax billing provides another example of savings of time. The manual methods of preparing and mailing the tax bills required about 40 hours of the clerk-treasurer's time. In 1988 she did this task in about 4 hours by using the computer, and stuffing the envelopes required approximately 1.5 of the 4 hours.

A number of additional applications had been discussed. The vendor of the village's system was preparing software for fire departments that would quickly display essential information to firefighters at the time of a call (nearest fire hydrant, dangerous substances in a building, etc.). Another microcomputer for use by the fire company had been discussed. Obtaining a software package for the justice court had been proposed. The clerk-treasurer planned to develop still more word processing applications and to develop cost records for streets. There had also been discussion of a microcomputer used for both the Village of Candor and the Town of Candor.

Who Operates the Computer and Uses its Products?

The clerk-treasurer was the only operator of the microcomputer at the time of the interview. She stated that when she is not dealing with the public, she is normally working on the microcomputer. She thought that she spends about two-thirds of her office hours working on the microcomputer.

How much training had the clerk-treasurer received? She had received some exposure to computers in a previous job, but her only formal training was approximately two hours per software module (for example, the general-ledger module) that she was using. This training was provided by the system vendor. Other than the formal training, she had studied the printer manual for approximately four hours and also had learned by the "trial-and-error" method. She attributed her lack of use of software manuals to the "excellent" training provided by the vendor. She contrasted her very favorable experience at the village office with a much less favorable experience with the computer system of a private company for whom she also works. In the latter case, the system vendor has provided little training, and costly mistakes have occurred, in good part due to poor training.

Candor has no formal management policy for the acquisition and use of microcomputers. This has not seemed necessary thus far. The types of hardware and software to be purchased were determined at the time the system was purchased. The types and priorities of applications also were largely determined at the time the system was selected and have evolved informally since then to the satisfaction of all concerned. It has always been clear who would operate the system -- the clerk-treasurer. Satisfactory training has been provided by the vendor, and its availability was determined at the time of purchase. No measures have been necessary to avoid physical and other complaints from the operator because her hours of work and interruptions of her use of the system by phone calls and visitors to the village hall naturally work against such problems.

Although the clerk-treasurer is the only microcomputer operator, numerous other persons also use the documents and data generated through use of the system. These persons include the mayor and trustees; the full-time employee who serves as water system operator, policeman, and chief of public works; the justices; the code enforcement officer; and members of the public. Examples of the uses of the microcomputer to directly serve the public are the preparation and addressing of a mandated notice to water customers and the preparation and printing of a village newsletter.

Positive and Negative Effects of Microcomputer Use

The clerk-treasurer indicated that the positive effects of microcomputer use for the village were more numerous and much more important than the negative effects. Tables 3 and 4 provide the complete lists of positive and negative effects that the clerk-treasurer reviewed during the interview for the case study. Each "X" in these tables indicates an effect experienced by Candor. The statements in parentheses provide condensed versions of comments that the clerk-treasurer made in relation to particular effects that she identified.

(Text continued on page 35.)

Table 3. POSITIVE EFFECTS OF MICROCOMPUTER USE IN THE VILLAGE OF CANDOR

	Possible positive effects	Effects experienced by Candor
1.	Use of computers owned by outsiders has decreased, resulting in increased control over data processing.	
2.	Accuracy of work has increased (example: water billing).	X
3.	Time has been saved (example: water billing).	X
4.	Time has been saved and is used to do tasks that there was no time to do before (example: indexing of minutes of trustees' meetings).	X
5.	Revenues have increased (slightly more revenues from water arrears because penalties are calculated immediately after non-penalty period ends).	X
6.	Costs have been avoided (no need for replacement office person when clerk-treasurer is on vacation).	X
7.	Expenses were actually reduced (number of office positions reduced from 1.5 full-time positions to 1 half-time position; post-card mailings substituted for letter mailings).	X
8.	It is easier to do the tasks done on the microcomputer than it was to do them manually.	X
9.	Work became more enjoyable and less tedious.	X
10.	Procedures for performing certain tasks have been improved -- the software process is better thought out and better suited to the task than the previous manual process (example: payroll).	X

Table 3 (continued).

Possible positive effects	Effects experienced by Candor
11. Paper storage is not growing at as fast a pace as it would have without use of the microcomputer.	X
12. Paper storage is actually less than before microcomputer use began.	
13. Sharing of information among officers and employees has increased.	X
14. Better information is made available for decision-making (it existed before, but now access is much more convenient).	X
15. Decision-makers expect more and better information (they ask for it now if it is not provided).	X
16. Work is completed on a more timely basis.	X
17. The appearance of documents has been improved.	X
18. The microcomputer operator has learned new skills.	X
19. The operator feels more positively about her job.	X
20. One or more officers or employees often are asked to assist less skilled microcomputer users -- and consider this a positive effect.	
21. Other positive effects: More capability to provide personalized service to village residents (example: information is easier to locate to answer inquiries from residents).	X

Table 4. NEGATIVE EFFECTS OF MICROCOMPUTER USE IN THE VILLAGE OF CANDOR

Possible negative effects	Effects experienced by Candor
1. Workloads increased significantly during conversion to use of the microcomputer (did financial records both manually and by microcomputer for a year).	X
If so, existing personnel handled this increased workload	X
If so, temporary personnel were added during the conversion period	
2. Workloads increased permanently.	
3. Job frustration increased temporarily for those learning to operate the microcomputer and/or implement its use.	X
4. Microcomputer operators are more frustrated with their jobs than before -- even after the initial learning period and/or implementation period.	
5. Job pressures and stress increased for microcomputer operators.	
6. Work became more difficult for microcomputer operators.	
7. Work became less enjoyable for microcomputer operators.	
8. Serious disagreements among microcomputer operators have developed over amount of time spent working on the microcomputer, when it is available for use, location, etc.	
9. Microcomputer operators complain about physical problems resulting from microcomputer use -- eye strain, backaches, etc.	
10. Incorrect information often has been produced and used for decisions.	

Table 4 (continued).

Possible negative effects	Effects experienced by Candor
11. A lower volume of work is produced.	
12. Work is <u>often</u> completed on a less timely basis than it was with manual methods.	
13. Costs have increased; productivity has not increased proportionately.	
14. The microcomputer saves time, but the time saved is not used to benefit the jurisdiction -- employees have more "slack" time.	
15. Revenues decreased.	
16. One or more officers or employees developed serious <u>and persisting</u> cases of computerphobia -- serious anxiety about or fear of using the computer, refusal to use it, etc.	
17. One or more employees quit or retired because of the microcomputer.	
18. The quality of documents has decreased.	
19. There is serious and unnecessary duplication of paper files and computer files.	
20. There is less capability to provide personalized service to residents.	
21. Officers and employees were forced to learn to operate the microcomputer and <u>still resent this</u>.	
22. One or more employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a negative effect.	
23. Other negative effects: (None identified.)	

Overall Evaluation

The clerk-treasurer is very pleased with the village's microcomputer system and the arrangements with the vendor for system support. When asked to separately rate the hardware and software on a scale of one (very dissatisfied) to five (very satisfied), she chose five in both cases. In addition, she stated that she was very satisfied with the support supplied by the vendor.

The clerk-treasurer was asked to choose a statement from among five alternatives to describe the financial and other costs versus the benefits of acquiring, learning to use, and using Candor's microcomputer system. The clerk-treasurer was asked whether the benefits were (1) much lower than the costs; (2) significantly lower than the costs; (3) about equal to the costs; (4) significantly greater than the costs; or (5) much greater than the costs. Her choice was number five.

V. MICROCOMPUTER ACQUISITION AND USE IN THE TOWN OF FORESTBURGH

Case-study interviewee: Evelyn Parks, Forestburgh Town Clerk. Interview conducted in May 1988.

Background: Town of Forestburgh

Forestburgh is a small town in Sullivan County in the Catskills area of New York State. The town's terrain is mostly hilly and forested. Town population expanded from 474 in 1970 to 796 in 1980, giving the town a rank of 846 among the 931 New York towns in existence in 1980.[22] Construction of scattered-site housing contributed to gradual increases in population from 1980 until 1987 when a 500-unit residential subdivision was begun; most of these units will be for year-round residents. Other than the company developing this large subdivision, there is no large employer in the town. Most employed residents work at jobs in the Town of Thompson, which borders Forestburgh on the north, and in Monticello, a village within Thompson. These two jurisdictions had a combined population in 1980 of 13,550.[23] A smaller number of employed residents work in the town on Forestburgh's southern border, Deerpark, and the city on Deerpark's southern border, Port Jervis. Deerpark had a 1980 population of 5,633, and Port Jervis' population in 1980 was 8,699.[24]

Forestburgh's officials, employees, and services are typical of those of many small Upstate towns. The supervisor and four councilmen form the town board, and the supervisor also serves as budget officer. The town clerk is elected as is the collector of taxes. The elected superintendent of highways directs a crew of six full-time employees and one part-time snowplow operator. The town has three elected assessors and a three-member board of

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[22] Office of the New York State Comptroller, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1979, (Albany, N.Y.: 1981), p. 88; and idem, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1980, pp. v and 90.

[23] Ibid., p. 132.

[24] Ibid., pp. 58 and 84.

assessment review. The planning board has seven members and a part-time secretary, and the zoning board of appeals has five members. The town board serves as the board of health and is assisted by a part-time health officer. Other part-time personnel include the historian, the dog control officer, the attorney, the code enforcement officer, and a combined receptionist and office assistant. A nine-member recreation board oversees a youth recreation program that provides a variety of activities in conjunction with the county youth bureau; one of the board's responsibilities is to oversee use of the town's swimming pool. There is also an adult recreation program provided in conjunction with a senior citizens group in the town. The town has no special districts.

The Process of Selecting Hardware and Software

The town supervisor took the lead in acquiring a microcomputer system for Forestburgh. Through the use of his personal Apple computer for a few town financial-management applications, he gained an appreciation of the possible benefits to the town if appropriate hardware and software could be identified and acquired. This led him to enroll himself and the town clerk in a two-day introductory microcomputer training session conducted by the Cornell Local Government Program in Poughkeepsie in early December 1985. At the workshop he discussed Forestburgh's needs and the likely costs of a system that would meet those needs with a representative of Financial Management Systems of Hopewell Junction, New York. This firm is a vendor of the MicroBudget integrated financial-management software.

A discussion with the town board led to an authorization for the supervisor to pursue acquisition further with the MicroBudget vendor, subject to a maximum amount to be spent. This decision was facilitated by the fact that two other board members had experience with microcomputers, one with a machine used in his home and the other with one at his place of employment. The subsequent interaction with the vendor produced a more specific definition of needs than before and a higher projected total cost for the required system than had been projected earlier. In spite of this, the town board authorized the purchase of the system. The hardware could have been purchased from the MicroBudget vendor along with the software. But the town decided to purchase it from a Computerland store in Newburgh that had agreed to provide favorable prices for customers referred to it by the MicroBudget vendor. Both he and the store personnel provided advice on the selection of hardware components.

The town clerk noted that there was some opposition expressed by senior citizens to the town's proposed purchase of a

microcomputer system. This involved concerns about excessive cost, whether new officers would know how to operate the equipment or could easily learn to do so, and whether the town "was big enough" to justify use of such technology. In the town clerk's opinion, this opposition was minor.

The town clerk herself had some reservations. She had had no experience with computers and was unfamiliar with microcomputer "jargon" when the supervisor initiated the acquisition process. Thus, she often felt quite lost and confused during the discussions about a prospective system. Having learned to operate specialized business machines used at a bank during a previous job, she thought that she could probably learn to operate a microcomputer. Nevertheless, she was apprehensive.

The town clerk had no specific thoughts on what should have been done differently during the acquisition process. She thought it was possible that the town could have acquired some different products that might have served it better, but she really did not know this to be a fact. From her perspective, she has been quite satisfied with the outcomes of the process.

Hardware, Software, and Support Arrangements

Forestburgh acquired almost all of its computer equipment in December 1985 from a Computerland store in Newburgh. The hardware consists of an IBM PC AT microcomputer with an IBM keyboard, a Sysdyne color monitor, an Epson FX 286 printer, two floppy disk drives, and a 1.2-megabyte hard disk. An Avatex 1200 modem was acquired at the same time. So was a computer table and chair. The town paid $4,000 for this equipment from a $12,000 bond anticipation note that it later paid off without issuing any bonds. An AST expansion board was added for $352 in December 1987 to expand the microcomputer's random access memory to 640 kilobytes.

Almost all of Forestburgh's software products were acquired from the MicroBudget vendor in December 1985. The MicroBudget products included modules entitled Financial Management, Vendor Payments, and Utility Billing as well as tutorial software. The payroll package included as part of this comprehensive financial management package was developed by Peachtree. Also included was a Lotus 1-2-3 "template" for budget preparation that the MicroBudget vendor had developed. Other software products that he provided as part of the total package were the Lotus 1-2-3 spreadsheet, the PFS Write word processor and spelling-checker, the PFS File database manager, and the Fastback software for "backing up" a hard disk. Forestburgh paid $8,000 for this software and approximately 25 hours of training from the vendor.

The town covered this cost with the remaining $8,000 from the bond anticipation note. In December 1987, the town acquired a town clerk's bookkeeping program for $1,000 from the MicroBudget vendor along with tutorial software for this program.

Forestburgh has an annual maintenance contract for its hardware with the hardware vendor. This contract cost the town approximately $900 for 1988. No problems have been experienced with the hardware.

Forestburgh also has a contract with the MicroBudget vendor for software support. This entitles the town to updates of the MicroBudget software and the town clerk's bookkeeping software as well as to consultations on problems with the vendor, either by telephone or through personal visits by him to the town hall. Under this arrangement, RDA Associates of Atlanta, Georgia, the developers of the MicroBudget software, may also be consulted by the town by telephone. The annual cost of the software support contract is $600. The town clerk has been quite pleased with this arrangement.

The only noteworthy problem experienced by the town clerk with the software that she uses has been the refusal of two state agencies to accept computer-generated reports. The Department of Environmental Conservation (DEC) has refused to accept the conservation report that the clerk produces with the town clerk's bookkeeping software, and the Department of Agriculture and Markets has not accepted the on report on dog-license fees that she produces with the same software. Both have insisted that the data for these reports be submitted on their particular forms. The dissatisfaction of a number of town clerks with the DEC requirement was made known to a DEC official in a 1988 meeting, and the town clerk has some hope that the rule will be changed. In contrast, the town clerk noted that the Bureau of Vital Records does accept the marriage-license monthly report that she generates with the town clerk's bookkeeping program.

The current supervisor is less satisfied with the software products that he uses and with the town's software support arrangement. He had been a member of the town board in the early 1980s, but was not a councilman in 1985 when the microcomputer system was acquired. In 1987 he ran against and defeated the incumbent supervisor. Upon taking office in January 1988, he was faced with the task of learning to use the MicroBudget, payroll, and budget preparation software as well as taking over the many other responsibilities of a town supervisor. Under the support arrangement with the MicroBudget vendor, he was entitled to and received "one-on-one" training from the vendor in the use of these modules. But he found that this was not a type of training that meshed well with his own learning style. He has received some assistance on particular questions from a person in the county's data processing department and from another town with

the same software. He has also worked on his own to learn to use the software products.

Forestburgh's modem has not been used for some time. The previous supervisor used it to communicate with the MicroBudget vendor to receive updates of the MicroBudget software and also to enable the vendor to help him identify and solve software problems.

Microcomputer Applications in Forestburgh

Forestburgh has a lengthy list of microcomputer applications. This list consists of the following:

Streets and highways

Record of permits issued for pavement cuts and subsequent repairs.
Record of permits issued for driveway culverts.

Garbage collection and disposal

Record of refuse collection license fees.

License and permit records and management

Record of revenues from sale of copies of zoning regulations.
Record of subdivision permits and fees.
Record of building permits and fees.
Record of dog licenses, fees, and fines.
Record of peddlars' permits and fees.
Record of marriage licenses and fees.
Record of conservation licenses and fees.
Record of swimming pool permits and fees.

Personnel

Personnel records for town officers and employees.

Central-staff financial management[25]

Accounts payable.
Monthly abstracts for review by the town board.
Check-printing, accounts payable.
Cash receipts for town clerk's office.

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[25] This term is defined in footnote 14 on page 11 of this report.

Payroll calculations.
Payroll check-printing.
Payroll reports.
Town clerk's monthly financial report to the town supervisor.

Central-staff word processing[26]

Maintenance of the rules of procedure of the town board.
Maintenance of membership lists of appointed boards and committees.
Preparation of agenda for meetings and hearings.
Preparation of minutes for boards and committees.
Indexing of minutes.
Preparation of proposed local legislation (resolutions, ordinances, and local laws).
Status of proposed local legislation.
Preparation of public notices to be posted or published.
Maintenance of mailing lists and production of mailing labels.
Preparation of bid specifications.
Preparation of notices to prospective bidders.
Development of contracts with the union of highway department employees.
Production of reports for town boards, state agencies, etc.
Maintenance of bylaws of senior citizens' organization.
General typing and filing.

The previous town supervisor used the microcomputer for a few additional applications. These included maintenance of the general ledger and accounts receivable and preparation of the annual budget, monthly financial reports to the town board, annual financial reports to the State Comptroller's Office, and newsletters for town residents.

When asked which applications are the most valuable, the town clerk replied from both her perspective and that of the broader town organization. From her personal perspective, she stated that the most valuable applications are, in order of importance, the various town clerk bookkeeping applications, the preparation of the town's clerk's monthly financial report, the preparation of minutes, and the indexing of minutes. Her primary criterion for these ratings was the amount of time she has been able to save in doing these tasks. From the town's perspective, the town clerk thought that, in order of importance, the most

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[26] This term is defined in footnote 14 on page 11 of this report.

valuable applications might be preparation of monthly abstracts for presentation to the town board, accounts payable, and payroll. The criteria she cited in this case were savings of personnel time, improved accuracy, better records, and easier access to account balances.

The period of time between the date of acquisition of the microcomputer and the date on which it was used to produce its first useful product was very brief. Before the end of the first week after its acquisition, the supervisor began using it for some of the town financial applications for which he had previously used his own computer, such as accounts payable and payroll. Shortly thereafter, the town clerk was able to produce her first useful computer output, a computer-printed edition of the rules of procedure of the town board.

The similarity in the approaches of these two users is noteworthy. Both chose their initial applications in good part because they had a base of knowledge for them. In the supervisor's case, this base was the financial applications on which he had previously worked. In the town clerk's case, her good typing skills provided a basis of knowledge for beginning with a word processing application.

The town has not considered acquisition of another computer. There has been some discussion of use of the existing machine for real property assessment purposes by the assessors.

Who Operates the Computer and Uses Its Products?

The town supervisor and the town clerk are the microcomputer operators in Forestburgh. The town clerk estimated that the supervisor spends an average of five hours weekly working on the computer and that she uses it an average of ten of the twenty hours weekly during which she maintains scheduled office hours.

For both operators, the amount of formal training has been modest. The town clerk received approximately ten hours of one-on-one training from the MicroBudget vendor, and the supervisor received approximately fifteen hours of the same type of training from the same vendor. The town clerk considered this training to be excellent, but, as noted earlier, the supervisor did not find it nearly as helpful. In addition, the town clerk received approximately twelve hours of training at the microcomputer workshop in Poughkeepsie mentioned previously.

Both operators also have learned to use the computer in other ways. For the town clerk, these other methods have included use of software tutorials, tutoring by the former supervisor, use of hardware and software manuals, "trial-and-

error," and consulting with the MicroBudget vendor. The other methods used by the town supervisor include assistance from the town clerk, use of manuals and software tutorials, trial-and-error, consulting with another town with software from the MicroBudget vendor, and consulting with an employee of the county data processing department.

Forestburgh has not attempted to define a formal management policy for the acquisition and use of microcomputer technology. Matters that such a policy might encompass have been decided on particular occasions as they have arisen, and no one has suggested a need for a formal statement.

Various parties use the data and documents developed on Forestburgh's microcomputer. In addition to the town supervisor and the town clerk, these parties include the other members of the town board, the superintendent of highways, the planning board, the zoning board of appeals, the recreation board, the justices, the town attorney, the dog control officer, the tax collector, the code enforcement officer, town employees, the senior citizens' organization, county offices, state agencies, and individual members of the public.

Positive and Negative Effects of Microcomputer Use

In the town clerk's opinion, the positive effects of microcomputer use in Forestburgh are significantly more numerous and important than the negative effects. Tables 5 and 6 provide the complete lists of positive and negative effects that the town clerk reviewed during the interview for this case study. Each "X" in the tables indicates an effect that Forestburgh has experienced. The statements in parentheses provide condensed versions of statements that the town clerk made concerning particular effects that she identified.

(Text continued on page 50.)

Table 5. POSITIVE EFFECTS OF MICROCOMPUTER USE IN THE TOWN OF FORESTBURGH

Possible positive effects	Effects experienced by Forestburgh
1. Use of computers owned by outsiders has decreased, resulting in increased control over data processing.	
2. Accuracy of work has increased.	X
3. Time has been saved.	X
4. Time has been saved and is used to do tasks that there was no time to do before (computer has helped town clerk handle significant increase in her work-load due to town's population growth).	X
5. Revenues have increased.	
6. Costs have been avoided.	X
7. Expenses were actually reduced (reduction of hours worked by bookkeeper of previous supervisor).	X
8. It is easier to do the tasks done on the microcomputer than it was to do them manually.	X
9. Work became more enjoyable and less tedious (especially true of former typing tasks now done with word processing software).	X
10. Procedures for performing certain tasks have been improved -- the software process is better thought out and better suited to the task than the previous manual process (applies to town clerk bookkeeping applications; format and content of minutes of meetings and hearings have been improved significantly).	X
11. Paper storage is not growing at as fast a pace as it would have without use of the microcomputer.	

Table 5 (continued).

Possible positive effects	Effects experienced by Forestburgh
12. Paper storage is actually less than before microcomputer use began.	
13. Sharing of information among officers and employees has increased.	X
14. Better information is made available for decision-making.	X
15. Decision-makers expect more and better information.	X
16. Work is completed on a more timely basis (easier to meet deadlines).	X
17. The appearance of documents has been improved.	X
18. The microcomputer operators have learned new skills.	X
19. The town clerk feels more positively about her job.	X
20. One or more officers or employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a positive effect.	
21. Other positive effects: More capability to provide personalized service to residents and employees (for example, to provide information to respond to calls about dogs).	X

Table 6. NEGATIVE EFFECTS OF MICROCOMPUTER USE IN THE TOWN OF FORESTBURGH

Possible negative effects	Effects experienced by Forestburgh
1. Workloads increased significantly <u>during conversion</u> to use of the microcomputer.	X
If so, existing personnel handled this increased workload.	X
If so, temporary personnel were added during the conversion period.	
2. Workloads increased <u>permanently</u>.	
3. Job frustration increased <u>temporarily</u> for those learning to operate the microcomputer and/or implement its use.	
4. Microcomputer operators are more frustrated with their jobs than before -- even after the initial learning period and/or implementation period.	
5. Job pressures and stress increased for microcomputer operators.	
6. Work became more difficult for micro-computer operators.	
7. Work became less enjoyable for micro-computer operators.	
8. Serious disagreements among microcomputer operators have developed over amount of time spent working on the microcomputer, when it is available for use, location, etc.	
9. Microcomputer operators complain about physical problems resulting from micro-computer use -- eye strain, backaches, etc. (town clerk occasionally experiences eye strain and backaches).	X

Table 6 (continued).

Possible negative effects	Effects experienced by Forestburgh
10. Incorrect information <u>often</u> has been produced and used for decisions.	
11. A lower volume of work is produced.	
12. Work is <u>often</u> completed on a less timely basis than it was with manual methods.	
13. Costs have increased; productivity has not increased proportionately.	
14. The microcomputer saves time, but the time saved is not used to benefit the jurisdiction -- employees have more "slack" time.	
15. Revenues decreased.	
16. One or more officers or employees developed serious <u>and persisting</u> cases of computerphobia -- serious anxiety about or fear of using the computer, refusal to use it, etc.	
17. One or more employees quit or retired because of the microcomputer.	
18. The quality of documents has decreased.	
19. There is serious and unnecessary duplication of paper files and computer files.	
20. There is less capability to provide personalized service to residents.	
21. Officers and employees were forced to learn to operate the microcomputer and <u>still resent this</u>.	

Table 6 (continued).

Possible negative effects	Effects experienced by Forestburgh
22. One or more employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a negative effect.	
23. Other negative effects: (None identified).	

The town clerk has developed her own responses to the eye strain and backaches that she occasionally experiences when working at the computer for lengthy periods of time. Taking a break or doing another kind of work for a short period of time helps with both problems. In addition, darkening the room in which the microcomputer is located helps counter the eye strain.

Overall Evaluation

The town clerk's overall evaluation of Forestburgh's hardware and software was quite favorable. On a one-to-five scale with one equivalent to very dissatisfied and five equivalent to very satisfied, she chose five for the town's hardware and four for its software.

The two most important problems or limitations noted by the town clerk were the transition in use of the microcomputer from the previous supervisor to the current supervisor and the lack of acceptance by the two state agencies of computer-generated reports.

The town clerk was asked to choose a statement from among five alternatives to describe the financial and other costs versus the benefits of acquiring, learning to use, and using Forestburgh's microcomputer system. She was asked whether the benefits were (1) much lower than the costs; (2) significantly lower than the costs; (3) about equal to the costs, (4) significantly greater than the costs; or (5) much greater than the costs. The town clerk noted that while the system provides many important benefits to the town, on the other hand, it was not cheap. But she also noted that "even a good typewriter these days is expensive" and that "the system will be used for a number of years and will save on personnel costs each year." Thus, as an overall statement for Forestburgh, she decided that the benefits were significantly greater than the costs.

VII. MICROCOMPUTER ACQUISITION AND USE IN THE TOWN OF LEWIS

Case study interviewee: Al Cross, Lewis Town Supervisor. Interview conducted in May 1988.

Background: Town of Lewis

Lewis is a small, rural town in Essex County in the Adirondack region of New York State. The town's 1980 population was 922, giving it a rank in terms of population of 813 among the 931 towns then in existence in New York.[27] There has been some population growth during the 1980s. Just across the town line in the Town of Elizabethtown is an unincorporated community of the same name that serves as the county seat of Essex County. Tourism, recreation, and natural resources exploitation are additional important activities in the area.

The town's officers and services are similar to those of many small, rural towns in Upstate New York. The town supervisor and four councilmen form the town governing board. The town board also serves as the board of health. The supervisor serves as building inspector and as water superintendent for the town's one water district. In addition, he is a member of the Essex County Board of Supervisors. In combination, his town and county duties constitute a full-time job. The supervisor is assisted with his bookkeeping responsibilities by a supervisor's bookkeeper who also serves as water rent collector. The superintendent of highways has a crew of four full-time employees, one part-time employee, and two "on-call" truck drivers for snow plowing. The superintendent of highways also is the maintenance person for the water district, and the highway department maintains the town parks. An attorney provides legal assistance to the town on a part-time, "as-needed" basis. The dog control officer also is employed on a part-time basis. The town provides lighting at various places in the town, but does not have any lighting districts. There is also a town landfill and a landfill attendant. Additional officers include the town clerk, the town tax collector, two town justices and a part-time

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[27] Office of the New York State Comptroller, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1980, pp. v and 102.

justice clerk, three assessors and five members of the assessment review board, eight election inspectors, and two historians.

The Process of Selecting Hardware and Software

The town supervisor had both general and specific reasons for starting the town down the path leading to microcomputer use. His first experience with a computer was through use of his own inexpensive Tandy Color computer. In the spring of 1984, he attended a one-day workshop taught by the Cornell University Local Government Program on microcomputer use by local governments. In the fall of the same year he attended a two-day workshop taught by the same organization that repeated part of the previous workshop, but also added a substantial focus on financial management applications.[28] On the basis of these experiences, the supervisor came to appreciate the potential that microcomputers offered small local governments for saving personnel time, improving productivity, and doing tasks for which there was not time when non-computerized methods were employed. The two specific applications for the town of Lewis that he thought should be computerized first to realize such benefits were budget preparation and the maintenance of the general ledger.

With these two applications in mind and the consent of the town board, the supervisor continued the acquisition process in a manner similar to that widely recommended by microcomputer specialists. At the second workshop, speakers from Cornell and the New York State Temporary Commission on Tug Hill had described two software products that the supervisor concluded would meet the town's needs.[29] One was the CYMA small-business general-ledger package that the commission staff and a local government accountant had modified for use by small towns and villages. The second was a budget preparation template for use with Lotus 1-2-3 (an electronic spreadsheet) that the Local Government Program had prepared under a contract with the commission and that the commission had used successfully in its region. Next the supervisor selected hardware that he believed would work with the selected software products. He preferred an IBM microcomputer, but chose a Tandy machine because it was IBM-compatible and was at least 40 percent cheaper. The town board accepted the

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[28] The workshops were sponsored jointly by the Cornell University Local Government Program and the New York State Supervisors and County Legislators' Association.

[29] The commission is a state agency that, among other things, provides assistance to towns and villages in the Tug Hill area.

supervisor's judgment that these products would work for the town, concluded that their costs were reasonable, and approved their purchase.

Although the town is not using the Cornell/Tug Hill budget template because it did not prove possible to use Lotus 1-2-3 with the town's computer, the supervisor was still very satisfied with the process that was followed to select the initial software and hardware products.

Hardware, Software, and Support Arrangements

The hardware was purchased from a local Radio Shack store in late November 1984. It consists of a Tandy 1000 microcomputer with a Tandy keyboard, monitor, and printer. The original size of the random access memory was 128 kilobytes, but in January 1985 it was expanded to 256 kilobytes. The computer has two floppy disk drives, but is not equipped with a hard disk or a modem. A computer desk and a printer stand were also purchased. Including the cost of cables, an initial supply of computer paper and diskettes, and one software product, the total cost was $2,912; regular revenues were used for the purchase.

The town has acquired four software products. A product called Deskmate came with the computer. This software is a combination word processing, spreadsheet, and file management product that the supervisor does not use because he considers it poorly designed. Another word processing product named Easywriter was purchased at a later date. So was Multiplan, an electronic spreadsheet. The town paid less than $200 for these two products. The fourth software product is the modified CYMA general-ledger package mentioned previously. The town paid $600 for this software and eight hours of training in its use provided by a Tug Hill Commission staff member.[30] As was the case for the hardware, regular revenues were used to purchase these products.

The supervisor has used the word processing and electronic spreadsheet products to create software applications that are used on a cyclical basis. The word processing package was used to create a set of standard "first-of-the-year" resolutions that can be easily modified for use in January of each year. Data are extracted from the general-ledger package and put into a format that the supervisor created with the word processing package to provide monthly financial reports for the town board. This involves substantially less time than was required to do this task manually. The electronic spreadsheet is used to maintain an

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[30] With the commission's approval, the Tug Hill staff person provided the training on his own time.

up-to-date listing of water customers for billing purposes. It also is used to maintain a fixed-assets inventory. A third use of the electronic spreadsheet was the development by the supervisor of his own version of the budget-preparation template previously developed by the Cornell Local Government Program for the Tug Hill Commission.

Although the town has no formal arrangements with external parties for hardware maintenance and software support, the supervisor thinks this has proved to be satisfactory. The supervisor has his own Tandy 1000 microcomputer in his home. This not only makes it possible for him to use a computer at home for town business, but also provides a "backup" computer if the town's computer needs repair. This has only happened once. The town machine was sent to Burlington, Vermont, for two weeks to have a chip replaced. Although no formal arrangements are involved, the supervisor has sometimes received advice on microcomputer use from a friend who is knowledgeable of microcomputers and from the county director of data processing.

Microcomputer Applications in Lewis

Microcomputer applications in Lewis consist of the following:

Water supply service

Maintenance of list of water customers and payment amounts.

Central-staff financial management[31]

Budget preparation by the budget officer (the supervisor).
Maintenance of the general ledger.
Fixed-assets inventory.
Preparation of data for the annual financial report.

Central-staff word processing[32]

Preparation of minutes for boards and committees.
Preparation of proposed local legislation (resolutions, ordinances, and local laws).

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[31] This term is defined in footnote 14 on page 11 of this report.

[32] This term is defined in footnote 14 on page 11 of this report.

Master record of approved local legislation.
Preparation of public notices to be posted or published.
Preparation of bid specifications.
Development of contracts.
Preparation of narrative reports for the town board, state agencies, etc.
General typing and filing.

In order of importance, the supervisor considers the most valuable applications for the town to be maintenance of the general ledger, budget preparation by the budget officer, and the various word processing applications. The primary criterion for these judgments is the amount of personnel time saved by doing these applications by computer as compared to manual methods.

The order in which applications were undertaken initially reflected primarily the point in the town fiscal year when the microcomputer was acquired and when it was possible to get assistance to begin the general-ledger and budget-preparation applications. When the microcomputer was acquired in late November 1984, work on the town budget for 1985 had already been completed. Also, only one month remained in the fiscal year, and it therefore seemed appropriate to complete the maintenance of the general ledger for fiscal year 1984 by manual methods rather than to start doing it on computer. Thus, the first use to which the supervisor put the computer was the preparation in late December 1984 of resolutions to be considered by the town board. In April 1985 a staff person of the Tug Hill Commission provided one day of training to the supervisor and the supervisor's bookkeeper on the CYMA general-ledger and the budget-preparation software products. Thereafter the supervisor spent approximately five hours developing an electronic spreadsheet template that duplicated the important features of the Cornell/Tug Hill budget-preparation software. The existing 1985 budget data were then entered into this template, and it also was used in the fall of 1985 to prepare the 1986 budget. After the training, the general-ledger data for January through April 1985 were used with the general-ledger software. To provide a check on the use of this software, the general ledger was maintained by both computer and manual methods for the remainder of the 1985 fiscal year.

The supervisor provided estimates of the amount of time saved for preparing the budget and the annual financial report. He estimated that he has reduced the time that he spends preparing the budget from 50 hours to 5 hours. The reduction has been so drastic that he has eliminated from the budget the $700 of compensation that he formerly budgeted for himself as budget officer. The supervisor also estimated that the time spent by his bookkeeper preparing the annual financial report has been reduced from 30 hours to 5 hours. The time savings reflect the

extent to which use of the general-ledger software facilitates the preparation of the figures to be entered into the report forms provided by the New York State Comptroller's Office.

When asked about possible additional applications, the supervisor mentioned three. The town is very interested in the assessment software being developed by the State Board of Equalization and Assessment. If this software is appropriate for use by Lewis, a computer communications link by telephone to the county's main-frame computer would probably be considered for maintenance of tax data on the larger machine. Also, another microcomputer probably would be purchased for use by the assessors. Payroll preparation is a second application of interest to the supervisor. Thirdly, he would like to further computerize the preparation of the town's annual financial report.

Who Operates the Computer and Uses Its Products?

The supervisor and the supervisor's bookkeeper are the microcomputer operators in Lewis. The supervisor's bookkeeper accounts for approximately 75 percent of the total amount of time that the machine is used, and the supervisor accounts for the other 25 percent. In terms of average hours per week, this means approximately 4.5 hours for the supervisor's bookkeeper and 1.5 hours for the supervisor.

The two operators used a mix of formal and informal methods to acquire their microcomputer training. Both attended the two workshops (a total of three days) taught by the Cornell Local Government Program. The supervisor's bookkeeper attended two classes offered by two local educational organizations (approximately two hours each week for a total of twenty weeks). Both operators received eight hours of training from the Tug Hill staff person. In addition, the supervisor spent a fair amount of time working with software tutorials and educating himself through reading and "trial and error." He helped train his bookkeeper, and she also used the trial-and-error approach. The bookkeeper considered her formal training to be excellent, and the supervisor rated his as adequate.

Lewis has no formal management policy governing the acquisition and use of microcomputer technology. The town has decided matters that could be covered in such a statement as they have come up, but a formal statement has not seemed necessary.

A policy matter that the town board has decided on an annual basis is the amount to be budgeted for software. The 1988 budget has an amount of $100 specifically budgeted for purchase of software, but other funds also could be used for this purpose if necessary.

Other parties in addition to the supervisor and his bookkeeper use the information and documents developed on Lewis' microcomputer. These parties include the other four members of the town board, the superintendent of highways, the town clerk, and members of the public who have reviewed copies of the town budget, public notices, and other documents developed on the computer.

Positive and Negative Effects of Microcomputer Use

In the supervisor's judgment, the positive effects of microcomputer use for Lewis have been much more important than the negative effects. Tables 7 and 8 provide the complete lists of positive and negative effects that the supervisor reviewed during the interview for this case study. Each "X" in the tables indicates an effect experienced in Lewis. The statements in parentheses provide condensed versions of comments that the supervisor made concerning particular effects that he identified.

(Text continued on page 63.)

Table 7. POSITIVE EFFECTS OF MICROCOMPUTER USE IN THE TOWN OF LEWIS

	Possible positive effects	Effects experienced by Lewis
1.	Use of computers owned by outsiders has decreased, resulting in increased control over data processing.	
2.	Accuracy of work has increased.	X
3.	Time has been saved.	X
4.	Time has been saved and is used to do tasks that there was no time to do before.	X
5.	Revenues have increased.	
6.	Costs have been avoided.	
7.	Expenses were actually reduced (elimination of compensation for budget officer).	X
8.	It is easier to do the tasks done on the microcomputer than it was to do them manually.	X
9.	Work became more enjoyable and less tedious.	X
10.	Procedures for performing certain tasks have been improved -- the software process is better thought out and better suited to the task than the previous manual process (budget preparation and maintenance of the general ledger).	X
11.	Paper storage is not growing at as fast a pace as it would have without use of the microcomputer.	
12.	Paper storage is actually less than before microcomputer use began.	

Table 7 (continued).

	Possible positive effects	Effects experienced by Lewis
13.	Sharing of information among officers and employees has increased (supervisor and supervisor's bookkeeper are able to share more information with town board and town clerk).	X
14.	Better information is made available for decision-making.	X
15.	Decision-makers expect more and better information (would be upset if it were not provided).	X
16.	Work is completed on a more timely basis (example: annual financial report).	X
17.	The appearance of documents has been improved (examples: proposed resolutions and monthly financial reports).	X
18.	The microcomputer operators have learned new skills.	X
19.	The operators feel more positively about their jobs.	X
20.	One or more officers or employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a positive effect (example: the supervisor's bookkeeper has asked the supervisor to help her learn to use the electronic spreadsheet).	X
21.	Other positive effects: More capability to provide personalized service to town residents.	X

Table 8. NEGATIVE EFFECTS OF MICROCOMPUTER USE IN THE TOWN OF LEWIS

Possible negative effects	Effects experienced by Lewis
1. Workloads increased significantly <u>during conversion</u> to use of the microcomputer (for both operators, but mostly for the supervisor's bookkeeper).	X
If so, existing personnel handled this increased workload (for two months, time commitment of supervisor's bookkeeper doubled from previous level).	X
If so, temporary personnel were added during the conversion period.	
2. Workloads increased <u>permanently</u>.	
3. Job frustration increased <u>temporarily</u> for those learning to operate the microcomputer and/or implement its use (but not to a great extent).	X
4. Microcomputer operators are more frustrated with their jobs than before -- even after the initial learning period and/or implementation period.	
5. Job pressures and stress increased for microcomputer operators.	
6. Work became more difficult for microcomputer operators.	
7. Work became less enjoyable for microcomputer operators.	
8. Serious disagreements among microcomputer operators have developed over amount of time spent working on the microcomputer, when it is available for use, location, etc.	

Table 8 (continued).

Possible negative effects	Effects experienced by Lewis
9. Microcomputer operators complain about physical problems resulting from microcomputer use -- eye strain, backaches, etc.	
10. Incorrect information often has been produced and used for decisions.	
11. A lower volume of work is produced.	
12. Work is often completed on a less timely basis than it was with manual methods.	
13. Costs have increased; productivity has not increased proportionately.	
14. The microcomputer saves time, but the time saved is not used to benefit the jurisdiction -- employees have more "slack" time.	
15. Revenues decreased.	
16. One or more officers or employees developed serious and persisting cases of computerphobia -- serious anxiety about or fear of using the computer, refusal to use it, etc.	
17. One or more employees quit or retired because of the microcomputer.	
18. The quality of documents has decreased.	
19. There is serious and unnecessary duplication of paper files and computer files.	
20. There is less capability to provide personalized service to residents.	

Table 8 (continued).

Possible negative effects	Effects experienced by Lewis
21. Officers and employees were forced to learn to operate the microcomputer and still resent this.	
22. One or more officers or employees often are asked to assist less skilled microcomputer users -- and consider this a negative effect.	
23. Other negative effects: (None identified).	

Overall Evaluation

The supervisor was generally quite satisfied with the town's microcomputer system. On a one-to-five scale with one indicating very dissatisfied and five indicating very satisfied, the supervisor chose five for both the hardware and the software. He indicated that for the small amount of money invested in the system, the town has received a very good return.

From the supervisor's perspective, the town had not yet experienced any important problems or limitations in using its microcomputer. In order to make space available for a computer work area in the town hall, a substantial volume of records had to be removed from a small room. But this should have been done anyway. Whether a new supervisor and supervisor's bookkeeper would want to use the microcomputer and, if so, how they could be taught to do so were matters of concern to the supervisor, but these possible transition problems had not yet been experienced.

The supervisor was asked to choose a statement from among five alternatives to describe the financial and other costs versus the benefits of acquiring, learning to use, and using Lewis' microcomputer system. He was asked whether the benefits were (1) much lower than the costs; (2) significantly lower than the costs; (3) about equal to the costs; (4) significantly greater than the costs; or (5) much greater than the costs. His choice was number four. He cited the gains in efficiency and the consequent savings of time as the primary reasons for this choice.

VI. MICROCOMPUTER ACQUISITION AND USE IN THE VILLAGE OF MACEDON

Case study interviewee: Gail Bradley, Macedon Village Clerk-Treasurer. Interview conducted in October 1988.

Background: Village of Macedon

Macedon is a prosperous village of medium size in the southwestern corner of New York's Wayne County. The village's population grew from 1,168 in 1970 to 1,400 in 1980, giving it a rank of 310 among the 555 villages in existence in the state in 1980.[33] Village population has continued to increase since then, but not a great number of vacant building sites remain. The village is located approximately 20 miles southeast of the City of Rochester on New York State Route 31 in the Town of Macedon (1980 population of 6,508).[34] Mobil Chemical, a manufacturer of plastic bags, is a major employer within the village. The elementary school has the next largest number of employees. In addition, there are numerous small retail stores. Most of the village's employed residents work in Rochester; a large percentage of them are employed by the Eastman Kodak and Xerox Corporations.

The village has a typical array of village officials, employees, and services for a village of its size within the "area of influence" of a large Upstate city. A mayor and four trustees constitute the village board of trustees. The clerk-treasurer also serves as registrar of vital statistics and collector of real property taxes and water and sewer payments. The clerk-treasurer is assisted by a deputy clerk-treasurer who also serves as secretary to the planning board and secretary to the zoning board of appeals. A part-time clerk does the water and sewer billings. The joint town and village police chief is assisted by two officers and a clerk. The police department operates out of a town building, and the town pays 60 percent of

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[33] Office of the New York State Comptroller, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1979, p. 164; and idem, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1980, pp. v and 166.

[34] Ibid., p. 108.

all other costs for police services. The village has a justice and an acting justice. The village's volunteer fire department also provides ambulance and EMT services to the village and to areas of the town. The village's superintendent of public works and three employees provide water, sewer, street, park, and cemetery services. The village provides sewage treatment for neighboring town sewer districts. Because of the chemical contamination of one of the village's wells, it purchases small quantities of water from the town at all times and larger quantities during drought conditions. The village contracts with the town so that village residents may participate in the town's recreation program. The village uses the town's real property assessment roll, and the village board of trustees serves as the board of assessment review. The positions of village attorney, engineer, and code enforcement officer are occupied by part-time appointees. The code enforcement officer also serves as the part-time crossing guard for the elementary school.

The Process of Selecting the Systems

The village first ventured into use of microcomputers in 1981. The clerk-treasurer was greatly interested in learning to use microcomputers and had identified specific financial management and word processing applications that she believed would be beneficial to the village. One of the department heads and two or three taxpayers objected when she proposed acquisition of a computer to the board of trustees. But the board gave her approval to start a search process after establishing a maximum amount to be spent for a system. The clerk-treasurer then began talking to vendors about hardware and software and also began reading Byte, a microcomputer magazine. She gradually came to the conclusion that an Apple III computer, the VisiCalc electronic spreadsheet, and the AppleWriter word processing software would allow her to undertake the initial applications that she had in mind and could be purchased for the maximum amount of money established by the board of trustees. This equipment and software were acquired.

In 1983 the village purchased a second Apple III machine because the clerk-treasurer and deputy clerk-treasurer had found themselves competing for use of the original machine. The second machine also enabled them to work on the same tasks at the same time.

The announcement by Apple that it would no longer support the Apple III model led the clerk-treasurer to approach the board about a switch to different equipment. Concerned about replying upon unsupported machines, she began to investigate IBM PC equipment. The original IBM PC had been introduced in 1981. Since then, the IBM PC models had become quite popular, and

numerous software products had been developed for use on them. The clerk-treasurer talked to a number of vendors and satisfied users of the IBM machines and these software products. She also read numerous magazine articles on the software products. When she approached the board about a possible switch to IBM equipment if she could raise the needed revenue by selling the Apple systems, it gave her approval to proceed. The Village of Oakfield in Genesee County agreed to pay the necessary amount, provided that the clerk-treasurer trained Oakfield personnel to use the Apple III systems. This deal provided the monies that enabled the village to acquire two IBM PC XT machines, other hardware, and two software products in September 1985.

In response to the question "What do you think you should have done differently in selecting hardware and software?", the clerk-treasurer stated that, with the benefit of hindsight, the village probably should have acquired one IBM PC AT and one IBM PC XT rather than two XT computers. This would have provided the clerk-treasurer with a machine with more speed, more random access memory (RAM), and more hard-disk storage capacity. These enhanced features would help relieve constraints she now confronts in using her XT.

Hardware, Software, and Support Arrangements

Most of Macedon's hardware was acquired in September 1985. The computers acquired then were two IBM PC XT microcomputers, each with 256 kilobytes of RAM, 20-megabyte hard disks, and IBM monitors and keyboards. The machine purchased primarily for use by the clerk-treasurer was equipped with an Okidata dot-matrix printer, and the one intended primarily for use by her deputy was equipped with an IBM letter-quality printer. One printer stand was originally purchased for use with an Apple III machine, and the second printer stand was purchased in 1988. The cost of the clerk-treasurer's hardware and printer stand was approximately $4,300, and the cost of the same items for the deputy was approximately $4,700. In August 1986 a modem was purchased for $295 for use with the clerk-treasurer's machine, and its RAM was upgraded to 512 kilobytes for $395. In May 1987, the RAM of the second machine was upgraded to 640 kilobytes for $160.

Some software products were acquired in September 1985, and others have been acquired since then. Table 9 lists the software products acquired for use on the two microcomputers. It also provides the dates of acquisition, costs, and types of vendors from which products were acquired.

Table 9. SOFTWARE PRODUCTS ACQUIRED BY THE VILLAGE OF MACEDON

Commercial name	Type of software	Date acquired	Cost	Type of vendor
MultiMate	Word processing	9/85	$395	Local computer store
MultiPlan	Spreadsheet	9/85	$156	Local computer store
Label Express	Creation of mailing labels	12/85	$ 95	Mail-order house
Newsroom	Newsletter preparation	4/86	$ 50	Local computer store
dBase III+	Database manager	1/87	$400	Mail-order house
Versa Receivables	Accounts receivable	1/87	$200	Publisher; sold by mail
Versa Payables	Accounts payable	1/87	$200	Publisher; sold by mail
IDS NY Code	Building records	3/87	$595	Publisher; sold by mail
Infomatics	General ledger	5/87	$4,500; +$700 for upgrade	Publisher; sold by mail
Lotus 1-2-3	Spreadsheet	2/88	$349	Mail-order house
Word Finder	Word processing thesaurus	2/88	$ 70	Mail-order house
Clerk's Index	Index creation	3/88	$900	Mail-order house
NicePrint	Printing utility	9/88	$ 95	Mail-order house

Three of the software products are not being used. After attempting to use the accounts receivable and accounts payable products, the clerk-treasurer concluded that they were not well suited to the village's requirements. She purchased the building-records software for the code enforcement officer's use after consulting with him. But he left the position before he learned to use the software, and the new person has not been interested in learning to use it.

The software products listed in Table 9 have been purchased with two sources of funds. The MultiMate and MultiPlan products were paid for with revenue from the sale of the Apple III systems. Since then, software products have been purchased each year with regular revenues budgeted by the board of trustees for this purpose. The clerk-treasurer stated that the board has been quite reasonable in making funds available for the purchase of software.

The clerk-treasurer has investigated integrated financial-management software packages, but thus far she has not found one that she thinks the village should purchase. One drawback of many of these "linked" packages, in her opinion, is that they are expensive for a small jurisdiction. A second drawback that she sees relates to the fact that different local governments may do specific financial-management tasks differently. A developer of local government financial-management software must, therefore, attempt to develop "main-stream" software -- products that do financial-management tasks in ways that most jurisdictions want to do them or at least in ways that they do not find unacceptable. Ideally, it should be possible to modify these products in minor ways to accommodate a particular jurisdiction. Unfortunately, the clerk-treasurer has not found an affordable integrated package that does financial applications as she wants them done or that could be easily modified to meet her expectations. She also admits, however, that she would be more willing to accept one of these packages if she did not get tremendous satisfaction from developing her own programs.

The clerk-treasurer has developed a number of programs with the commercial packages noted above and plans to develop others. Using the Lotus 1-2-3 spreadsheet, she developed a program to keep track of earnings from village investments and to distribute the interest earnings from a single certificate of deposit to a number of funds. Other spreadsheet programs that she developed with MultiPlan are for the maintaining of a fixed-assets inventory and for preparation of annual budgets, monthly abstracts for presentation to the village trustees, and monthly financial reports to the trustees. Using the MultiMate word processor, she developed standard formats for agenda, resolutions, local laws, minutes, and reports required for the conduct of the village's operations. In the near future, the

clerk-treasurer plans to use the dBase III+ database manager to develop a water and sewer-billing program.

Macedon has a service contract with IBM for the two computers and their printers, and the clerk-treasurer considers this a satisfactory arrangement. The contract calls for "same-or-next-day" service and currently costs $1,260 annually.

Most of the hardware problems experienced by Macedon have involved hard disks. The hard disk on the deputy clerk-treasurer's computer has been replaced three times. All of the data on the hard disks have been lost a number of times, but it has been possible to reconstruct essential data without great difficulty from files stored on floppy diskettes. The clerk-treasurer personally installed a 30-megabyte hard disk in her machine, but it "crashed" and the IBM service person informed her that he would cancel the service contract unless she refrained from attempting to use 30-megabyte hard disks. Macedon also experienced a problem with one of the printers, but this was quickly resolved by the IBM service person.

Macedon is not paying any annual fees for software support, but has not found the lack of software support to be a serious disadvantage. The village did pay $700 for an "upgrade" to the Infomatics software, but this is not an annual expense. The clerk-treasurer and her deputy have found some software manuals difficult to understand, and the clerk-treasurer experienced a problem with the MultiPlan spreadsheet that she was unable to resolve. The only other problem was that it was not possible to do the things she wanted to do with the accounts receivable and accounts payable software products, and therefore they are not used.

The modem for the clerk-treasurer's machine has been used for two purposes. One is to connect her computer in the village hall with a computer in her home so that she can do village work there. Also, she used it for about ten months to connect to Compuserve, a national computer network, to obtain data useful for village purposes, such as current interest rates on different investment options. The cost averaged about $50 monthly, and the clerk-treasurer concluded that this was too high a price for the benefits the village was receiving.

Microcomputer Applications in Macedon

Macedon's list of microcomputer applications is quite lengthy. It consists of the following:

Real property assessments, taxes, and records

Maintenance of parcel information.
Tax collection.
Searches for unpaid property taxes and water and sewer bills for attorneys handling property sales.

Water supply service

Recording customer payments.
Developing trial balances.

Sewer service

Recording customer payments.
Developing trial balances.

Personnel

Permanent records for individual employees.
Record of unusual salary payments.

Central-staff financial management[35]

Budget preparation by the budget officer (the clerk-treasurer).
General ledger.
Accounts payable.
Monthly abstracts for review by the board of trustees.
Accounts receivable.
Cash receipts.
Cash management.
Fixed-asset accounting.
Monthly financial reports to the board of trustees.
Annual financial report to the State Comptroller's Office.
"What if" scenarios for revenues.

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[35] This term is defined in footnote 14 on page 11 of this report.

Central-staff word processing[36]

Maintenance of membership lists of appointed boards and committees.
Preparation of agenda for meetings and hearings.
Preparation of minutes for boards and committees.
Preparation of proposed local legislation (resolutions and local laws).
Preparation of public notices to be posted, published, or mailed.
Master record of approved local legislation.
Indexing of approved local legislation.
Maintenance of mailing lists and production of mailing labels.
Production of form letters, including bid notices to prospective bidders.
Development of contracts.
Production of reports for the board of trustees, state agencies, etc.
Election calendar "tickler" file.
General typing and filing.

In terms of order of importance for the village, the clerk-treasurer considers the bookkeeping applications done with the Infomatics software to be the most valuable and the word processing applications to be the second most valuable. Increased accuracy, time savings, and the greater ease of answering the many questions received from the board of trustees, department heads, and the public on revenues and expenditures are her reasons for the higher rating for the bookkeeping applications. The chief advantages of the word processing applications are time savings and the improved quality of documents.

The applications that the clerk-treasurer undertook first after the acquisition of the original Apple III computer are consistent with the above statements. Her primary objective was to begin with financial applications in order to save time and to produce more accurate work. The first day that the Apple III was in her office she produced an investment report for a meeting that evening of the board of trustees. Next, spurred on by a desire to help the board consider the need for a decision on real property tax rates, she set up a spreadsheet program for preparing and analyzing the village budget. A third initial use was the preparation of agenda on the word processing software.

Additional applications and machines have been discussed for the village. The clerk-treasurer wants to use the Newsroom

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[36] This term is defined in footnote 14 on page 11 of this report.

software to prepare regular newsletters for village residents. At the time of the interview, she had invested some effort towards achieving this objective. The board of trustees agreed to the clerk-treasurer's participation in a special dBase training school in August 1988 on condition that she use this software to create a water and sewer-billing program. The clerk-treasurer and the deputy are interested in creating a database that would contain information on each parcel of property in the village; their interest stems from their realization that the great bulk of the information that they maintain can be tied to specific properties and that the great bulk of the questions that they must answer also relate to specific properties. Check-printing for accounts payable and paychecks and preparation of payroll reports are additional applications of interest to the clerk-treasurer and her deputy, although it may not be possible to tackle these applications in the near future. The purchase of microcomputers for the joint town and village police department and for the village justice had also been discussed.

Who Operates the Computers and Uses Their Products?

The clerk-treasurer and the deputy clerk-treasurer operate the two microcomputers. The clerk-treasurer stated that her computer is "on" eight hours each day, Monday through Friday. Unless she is using the telephone or dealing with persons who come to the village hall, she is almost always working on the computer. Even the telephone calls and "walk-ins" often give rise to something to do on the computer, such as answering a question relating to a particular parcel of property. The deputy clerk-treasurer works three days weekly and uses her computer approximately 60 percent of the time that she spends in the village hall.

Both formal and informal methods of microcomputer training have been important for the Macedon operators. The clerk-treasurer received seven days of training, two days on "advanced IBM-DOS" in June 1986 at a cost of $135 and five days on dBase in August 1988 at a cost of $795. Both operators have used other learning methods -- software tutorials, "trial-and-error," studying hardware and software manuals, and reading computer magazines, books, and other literature. In addition, the clerk-treasurer has spent some time tutoring the deputy clerk-treasurer and helping her resolve problems. Occasional assistance has been received from the IBM service person, but there is no other formal or informal arrangement for such assistance.

Macedon has no formal management policy concerning the acquisition and use of microcomputer technology. The matters that could be detailed in such a statement have been decided by

the board of trustees and the two operators on an "as-needed" basis. No one has seen a need for a formal management policy.

There are numerous users of the data and documents developed on Macedon's microcomputers. In addition to the clerk-treasurer and her deputy, other users within the formal village organization are the mayor and the other members of the board of trustees, the police chief, the fire chief, the superintendent of public works, the town engineer, and the town attorney. The county real property tax services office, the county clerk's office, and the office of the clerk of the county legislature are another category of users of data and documents developed on the computers. A third category of users consists of private organizations, such as insurance companies, legal firms, and an engineering firm that is doing work for the town related to a proposed county water district. A fourth category of users are village residents and other individual citizens who ask for information stored on the computers or for copies of documents developed on the computers.

Positive and Negative Effects of Microcomputer Use

The clerk-treasurer indicated that for Macedon the positive effects of microcomputer use far outweigh the negative effects in both number and importance. Tables 10 and 11 provide the complete lists of positive and negative effects that the clerk-treasurer reviewed during the interview for this case study. Each "X" in the tables indicates an effect experienced in Macedon. The statements in parentheses provide condensed versions of statements that the clerk-treasurer made concerning particular effects that she identified.

(Text continued on page 80.)

Table 10. POSITIVE EFFECTS OF MICROCOMPUTER USE IN THE VILLAGE OF MACEDON

Possible positive effects	Effects experienced by Macedon
1. Use of computers owned by outsiders has decreased, resulting in increased control over data processing.	
2. Accuracy of work has increased.	X
3. Time has been saved.	X
4. Time has been saved and is used to do tasks that there was no time to do before.	X
5. Revenues have increased.	
6. Costs have been avoided.	X
7. Expenses were actually reduced.	
8. It is easier to do the tasks done on the microcomputer than it was to do them manually.	X
9. Work became more enjoyable.	X
10. Procedures for performing certain tasks have been improved -- the software process is better thought out and better suited to the task than the previous manual process.	X
11. Paper storage is not growing at as fast a pace as it would have without use of the microcomputer.	
12. Paper storage is actually less than before microcomputer use began.	
13. Sharing of information among officers and employees has increased.	X

Table 10 (continued).

Possible positive effects	Effects experienced by Macedon
14. Better information is made available for decision-making.	X
15. Decision-makers expect more and better information (now expect too much at times).	X
16. Work is completed on a more timely basis.	
17. The appearance of documents has been improved.	X
18. The microcomputer operators have learned new skills.	X
19. The operators feel more positively about their jobs.	X
20. One or more officers or employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a positive effect (clerk-treasurer receives questions from other local governments).	X
21. Other positive effects: (None identified).	

Table 11. NEGATIVE EFFECTS OF MICROCOMPUTER USE IN THE VILLAGE OF MACEDON

	Possible negative effects	Effects experienced by Macedon
1.	Workloads increased significantly during conversion to use of the microcomputer (did financial records both manually and by microcomputer during learning period).	X
	If so, existing personnel handled this increased workload	X
	If so, temporary personnel were added during the conversion period	
2.	Workloads increased permanently.	
3.	Job frustration increased temporarily for those learning to operate the microcomputer and/or implement its use.	X
4.	Microcomputer operators are more frustrated with their jobs than before -- even after the initial learning period and/or implementation period.	
5.	Job pressures and stress increased for microcomputer operators.	
6.	Work became more difficult for micro-computer operators.	
7.	Work became less enjoyable for micro-computer operators.	
8.	Serious disagreements among microcomputer operators have developed over amount of time spent working on the microcomputer, when it is available for use, location, etc.	
9.	Microcomputer operators complain about physical problems resulting from micro-computer use -- eye strain, backaches, etc. (deputy suffers minor "eye burn" after prolonged use).	X

Table 11 (continued).

Possible negative effects	Effects experienced by Macedon
10. Incorrect information often has been produced and used for decisions.	
11. A lower volume of work is produced.	
12. Work is often completed on a less timely basis than it was with manual methods.	
13. Costs have increased; productivity has not increased proportionately.	
14. The microcomputer saves time, but the time saved is not used to benefit the jurisdiction -- employees have more "slack" time.	
15. Revenues decreased.	
16. One or more officers or employees developed serious and persisting cases of computerphobia -- serious anxiety about or fear of using the computer, refusal to use it, etc.	
17. One or more employees quit or retired because of the microcomputer.	
18. The quality of documents has decreased.	
19. There is serious and unnecessary duplication of paper files and computer files.	
20. There is less capability to provide personalized service to residents.	
21. Officers and employees were forced to learn to operate the microcomputer and still resent this.	

Table 11 (continued).

Possible negative effects	Effects experienced by Macedon
22. One or more employees <u>often</u> are asked to assist less skilled microcomputer users -- and consider this a negative effect.	
23. Other negative effects: Continuing complaints from a very few residents about unnecessary expenditures on microcomputer technology, especially during budget hearings.	X

A few additional statements made by the clerk-treasurer concerning positive and negative effects are noteworthy. She thinks that it might be possible to eliminate the part-time position for utility billings after she develops the utility-billing program. She noted that there would probably have been serious disagreements over computer access if the village had not purchased both the second Apple III and later the second IBM PC XT. The color monitors were purchased in the hope that they would eliminate or at least reduce the "eye burn," and they do seem to help with this problem. Finally, the low level of opposition that the village continues to receive about its use of microcomputer technology involves arguments that the village is not large enough to need such "fancy" technology, that it costs too much, that the users are really wasting time playing games, and that "it hasn't been done before." From the clerk-treasurer's perspective, these arguments stem from a lack of appreciation of all the demands on the village's main office and a failure to realize that even a small village is a quite complex organization whose efficient management requires sophisticated tools.

Overall Evaluation

The clerk-treasurer is quite pleased with the village's microcomputer systems. On a one-to-five scale with one equivalent to very dissatisfied and five equivalent to very satisfied, she chose four for the village's hardware. She indicated that she would have chosen five if her computer were faster and had more RAM and a larger disk drive. Expressed another way, she thinks an IBM PC AT and a PC XT would have been a better combination than the two XT's. On the same scale, she chose a rating of five for the village's software.

The only important limitations noted by the clerk-treasurer were the lack of affordable, flexible commercial software developed for New York local governments that would meet the village's needs, her own lack of time to develop more programs, and the very limited number of programs available from state agencies for use by local governments.

The clerk-treasurer was asked to choose a statement from among five alternatives to describe the financial and other costs versus the benefits of acquiring, learning to use, and using Macedon's microcomputer systems. She was asked whether the benefits were (1) much lower than the costs; (2) significantly lower than the costs; (3) about equal to the costs; (4) significantly greater than the costs; or (5) much greater than the costs. Her choice was number five.

VIII. MICROCOMPUTER ACQUISITION AND USE IN THE TOWN OF PIERREPONT

Case-study interviewee: Dale Vaughn, Supervisor's Clerk and Chairman of the Board of Assessors, Town of Pierrepont. Interview conducted in May, 1988.

Background: Town of Pierrepont

Pierrepont is a rural town in Northern New York's St. Lawrence County. It has a total of approximately 60 square miles and is immediately adjacent to the Towns of Canton and Potsdam. Within the Town of Canton lies the Village of Canton, the location of St. Lawrence University and the Canton College of Technology, a unit of the State University of New York (SUNY). Similarly, the Village of Potsdam in the Town of Potsdam is the site of Clarkson University and the State University Center at Potsdam, another SUNY unit. The four colleges are the largest employers in the immediate area. The town has a largely open and forested landscape, but has experienced significant increases over the last two decades in population and residential subdivisions. Its population expanded from 1,726 in 1970 to 2,207 in 1980, giving the town a population rank of 529 among the 931 New York towns in existence in 1980. The Towns of Canton and Potsdam and their two villages with the same names also experienced significant increases in population between 1970 and 1980.[37]

There are approximately fifty persons directly involved in governing the town and providing its services, most of them serving on a part-time basis. The town board consists of the supervisor and four councilmen and receives legal assistance on a part-time basis from an attorney. The supervisor's clerk is also the chairman of the three-member board of assessors; his agreement with the town calls for him to work approximately twelve hours weekly at the former job and six hours weekly at the latter position. He also has his own accounting business. The town clerk serves as tax collector and works four and one-half days weekly at the two

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[37] Office of the New York State Comptroller, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1979, pp. v, 76, 118, 146, and 176; and idem, Special Report on Municipal Affairs for Local Fiscal Years Ended in 1980, pp. 78, 120, 150, and 178.

positions; the part-time deputy town clerk also serves as deputy tax collector. The full-time superintendent of highways oversees a highway crew of eight employees that is responsible for 82 miles of town roads and the plowing of snow for 22 miles of county roads. The Niagara Mohawk Power Company maintains the one town lighting district. The town justice has a part-time court clerk. The code enforcement officer enforces the state building and fire prevention code, refuse disposal regulations, and a zoning code with junk-car provisions. The dog control officer, the constable, the refuse recycling facility attendant, and the historian, who also manages the town museum, hold additional part-time positions. The town has a seven-member planning board, a seven-member board of zoning appeals, and a three-member board of assessment review.

The Process of Selecting Hardware and Software

The inexpensive software for preparing town budgets available from the Cornell University Local Government Program (the Town Budget Worksheet) proved to be a catalyst in Pierrepont's purchase of microcomputer hardware and software. In the fall of 1986, there was much discussion among town board members of the pros and cons of purchasing a microcomputer. A key impetus for the discussion was the hope expressed by the supervisor's clerk that the town could achieve a significant financial savings -- perhaps up to $2,000 annually -- by using a microcomputer to maintain its assessment roll rather than paying St. Lawrence County to do this task on its mainframe computer. At the same time considerable frustration developed at town board meetings because of lengthy and inconclusive discussions of various alternative expenditure and revenue options and the consequent need for numerous reworkings of the budget figures. The arrival by mail of a description of the Town Budget Worksheet, a product that promised to relieve a large portion of such budgeting frustrations, brought the debate over purchasing a microcomputer to a conclusion. Although some opposition remained, the town board decided to make the purchase.

Although he had no previous experience with computers, at the town board's direction, the supervisor's clerk took the lead in investigating appropriate products. He discussed with the town board and other town officers the applications for which software should be sought. After agreement was reached, he identified software products that he thought could be used successfully for those applications. He then began to investigate hardware that would run the software products in which he was interested. Study of a microcomputer book and discussions with the county director of real property tax services and the personnel of a local computer store helped him settle on hardware recommendations. His preference was an IBM microcomputer because of his lack of familiarity with and confidence in microcomputers from other manufacturers; this preference was reinforced by the store

personnel with whom he consulted. The town board members and other town officials endorsed his hardware and software recommendations, and he proceeded to purchase these products.

In retrospect, the supervisor's clerk stated that the only thing that should have been done differently in the acquisition process was a more thorough investigation of printers. The selected printer has fallen significantly short of meeting his expectations. He has concluded that he should have learned more about printers and should have insisted that the computer store personnel demonstrate to him that a given printer could be used with the selected computer and software to produce the types of printouts that he wanted.

Hardware, Software, and Support Arrangements

Pierrepont's microcomputer hardware was purchased from a local computer store in October 1986. It consists of an IBM PC XT microcomputer with an IBM keyboard, a Sysdyne monitor, and a Star SP15 printer. The computer has 640 kilobytes of random access memory, one floppy disk drive, and a 20-megabyte hard disk drive. The total cost of this equipment as well as some additional miscellaneous hardware items was $3,507; regular revenues were used to purchase the hardware.

During its first year of use, the equipment was located in the home office of the supervisor's clerk. He maintains this office for both town and private-business purposes. Since the supervisor's clerk was expected to be the initial primary user, having the computer in this office facilitated his learning to use it because he initially had to do much of this learning on his own time. However, the other two assessors also used the computer to some extent while it was located in his home. Another reason for the initial location was the lack of a suitable office space in the town hall for using and protecting a microcomputer system.

The microcomputer was moved to the town hall in November 1987. To facilitate this, the town put in a separate office in the town hall for the use of the supervisor, the supervisor's clerk, the code enforcement office, and the assessors. The town also spent $175 to buy a printer stand, computer desk, and desk chair.

Pierrepont purchased a number of software products at the same time that it purchased the computer. These consisted of Lotus 1-2-3, an electronic spreadsheet package ($350); the Town Budget Worksheet, computer files for use with Lotus 1-2-3 for developing town budgets ($50); Back to Basics, a general-ledger package developed for small businesses ($260); Peachtree Payroll, a payroll package developed for small businesses ($340); and Write-n-Spell, a

word processing package ($150). As in the case of the microcomputer, regular revenues were used to pay for these products.

Other software products were purchased at various times during 1987. These included DAC-Easy Base, a database manager; 101 Macros, an "add-on" product for Lotus 1-2-3 for expanding its capabilities; 1-2-3 Report Writer, another Lotus 1-2-3 add-on product that allows the user more flexibility in creating Lotus 1-2-3 printouts; Financial Functions, a program for financial analysis of proposed loans and bond issues; and Disk Opt, a program for helping ensure efficient use of data storage capacity on a hard disk. The supervisor's clerk learned about these products through his reading of microcomputer magazines and concluded that they were sufficiently inexpensive that he could gamble on ordering them by mail without the benefit of demonstrations. The total amount paid for them was approximately $350. The funds came from a budgeting account created for the purchase of software, computer supplies, and related items.

The supervisor's clerk also invested a fair amount of time in using some of the above software products to create his own applications programs. One of these is a Lotus 1-2-3 template that reports data from the general-ledger program in the form of a supervisor's monthly financial report. Another application created by the supervisor's clerk consists of formats for printing real property tax data; these were created through the use of Lotus 1-2-3 and 1-2-3 Report Writer. A third such application was created through use of the same two software products and the word processing package; it is used to notify owners of real property of changes in assessment values.

Although Pierrepont does not have formal arrangements for hardware maintenance and software support, the supervisor's clerk thinks that this has worked out satisfactorily. The hardware has not needed repair, and thus no repair expenses have been incurred. If the town had contracted for hardware maintenance, no concrete benefits would have been realized. The lack of software support arrangements has meant that the supervisor's clerk has sometimes had to modify programs. For example, when tax rates need to be changed in the payroll software, the supervisor's clerk changes them. He has not considered the need to make such changes a significant burden.

Microcomputer Applications in Pierrepont

Pierrepont is using its microcomputer hardware and software for a number of applications. They consist of the following:

Real property assessment

Maintenance of parcel information.
Establishing assessed values.
Preparation of assessment notices.
Preparation of form letters to owners of real property.

Streets and highways

Developing cost estimates for repair and construction projects.
Developing bid specifications.

Central-staff financial management[38]

Budget preparation by the budget officer (the supervisor's clerk).
General ledger.
Payroll calculations.
Payroll check-printing.
Supervisor's monthly financial reports to the town board.

Central-staff word processing[39]

Routine correspondence of the town supervisor, superintendent of highways, and assessors.

Although maintenance by microcomputer of the town's assessment roll was a primary motive for purchasing the microcomputer, this application has not yet been undertaken. The town planned to use the microcomputer as a terminal for the maintenance of these data on the county's mainframe computer. But the county began a process of choosing and implementing the use of a new mainframe computer that has resulted in a lengthy delay in connecting the town's microcomputer to the county's machine for real property tax purposes.

The supervisor's clerk indicated that from his viewpoint, Pierrepont's three most important applications, in order of

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[38] This term is defined in footnote 14 on page 11 of this report.

[39] This term is defined in footnote 14 on page 11 of this report.

importance, were the supervisor's monthly financial reports, budget preparation, and payroll calculations and check-printing. The primary criterion for these ratings was the amount of time he had been able to save in doing these tasks by computer rather than by non-computer methods. The supervisor's clerk expects that he will consider maintenance of the assessment roll one of the three most important applications when it becomes possible to do this task with the microcomputer.

The approach that Pierrepont used in 1987 with the budgeting software is noteworthy. Rather than a preliminary budget, the town board received from the supervisor and the supervisor's clerk three different possible budgets: an "austerity" budget, a "middle-of-the-road" budget, and an "enhanced-services-and-facilities" budget. This approach helped clarify the broad choices available to the town board. The capacity to quickly do and redo the numerous calculations afforded by the budgeting software made it feasible to take this approach. This same capacity made it possible to quickly experiment with variations on these budgets in the process of arriving at the final budget figures.

Before he began using the microcomputer, the supervisor's clerk had found himself working an average of eighteen hours weekly as supervisor's clerk even though his salary for this position was based on an expectation of twelve hours weekly. He now finds his average weekly hours much closer to the agreed-upon twelve hours.

The choice of applications to be computerized first reflected both the timing of the acquisition of the hardware and software and a strategy of tackling first the applications likely to save the most time for the supervisor's clerk and thereby allow him to undertake still other applications. Both the microcomputer hardware and the software necessary for preparing the town budget arrived in October 1986 in the midst of budget discussions. Only a week after the arrival of the Town Budget Worksheet software, the supervisor's clerk was able to generate proposed budgets by computer for the town board's consideration. Next he computerized the supervisor's monthly financial reports, the general ledger, and the payroll. As done manually, all of these had been time-consuming and tiresome tasks. Computerizing them first freed him to tackle other applications and to undertake more financial planning activities.

The supervisor's clerk stated that it would probably be at least two or three years before the town acquired another microcomputer, but in the meantime he expected that he and others would make much more use of the existing microcomputer. He was planning to provide training on an "as-needed" basis to other interested town officials. With these additional users, it is possible that the microcomputer will be used 20-25 hours weekly by the end of 1988. He did not think that it was likely that conflicts would develop over access to the machine or that a formal

schedule for its use would be necessary. In part, this is because he now has the same type of microcomputer in his home office and can do a portion of his town microcomputer work there.

Who Operators the Computer and Uses Its Products?

The supervisor's clerk has been the principal microcomputer operator for Pierrepont. He estimated that he has accounted for 95 percent of the time that Pierrepont officers have spent working on a microcomputer for town purposes. This estimate includes the time he has spent using his own microcomputer for his town duties. The other two assessors, the code enforcement officer, and the zoning board chairperson have accounted for the other 5 percent of the time spent working at a microcomputer for town purposes.

The supervisor's clerk learned to use the computer without formal training. No formal training, such as a workshop or one-on-one instruction, was included in the price paid for the hardware and software initially purchased in October 1986. As noted before, the remaining software products were purchased through the mail, and no formal training was provided for them either. No one has been available on either a regular or "as-needed" basis to advise him on using the microcomputer. The methods used by the supervisor's clerk to train himself included study of computer and software manuals, use of software tutorials, and a considerable amount of "trial and error." He did not feel that he had wasted very much time with the trial-and-error approach because he was learning even when he was trying to do things in the wrong way.

Pierrepont has no formal management policy for the acquisition and use of microcomputer technology. Although the town and the supervisor's clerk have decided many of the questions that should be answered by such a policy, they have not seen a need to write and adopt a formal policy statement.

One policy matter that the town has decided on an annual basis is the amount budgeted for software, supplies, repairs, and related miscellaneous items. The town budgeted $1,000 for 1987 and spent approximately $700. The same amount was budgeted for 1988, and approximately $100 had been spent by the middle of May. This account will also be used for paying for the telephone line to connect the microcomputer to the county's mainframe computer for real property tax purposes when this becomes feasible. The supervisor's clerk expected that the basic monthly service charge for this telephone line would be approximately $35.

In addition to the supervisor's clerk and the other operators noted above, other parties use the information and documents developed on Pierrepont's microcomputer. These parties include the supervisor, the other members of the town board, the town clerk,

the superintendent of highways, the chairperson of the planning board, and town property owners and others who have received notices, copies of the budget, and other documents generated on the computer.

Positive and Negative Effects of Microcomputer Use

The supervisor's clerk indicated that for Pierrepont the positive effects of microcomputer use clearly outweighed the negative effects, both in number and importance. Tables 12 and 13 provide the complete lists of positive and negative effects that the supervisor's clerk reviewed during the interview for the case study. Each "X" in these tables indicates an effect experienced in Pierrepont. The statements in parentheses provide condensed versions of comments that the supervisor's clerk made in relation to particular effects that he identified.

(Text continued on page 94.)

Table 12. POSITIVE EFFECTS OF MICROCOMPUTER USE IN THE TOWN OF PIERREPONT

	Possible positive effects	Effects experienced by Pierrepont
1.	Use of computers owned by outsiders has decreased, resulting in increased control over data processing.	
2.	Accuracy of work has increased.	X
3.	Time has been saved.	X
4.	Time has been saved and is used to do tasks that there was no time to do before (analysis of bond issue; development of alternative budgeting scenarios).	X
5.	Revenues have increased.	
6.	Costs have been avoided.	
7.	Expenses were actually reduced.	
8.	It is easier to do the tasks done on the microcomputer than it was to do them manually.	X
9.	Work became less tedious.	X
10.	Procedures for performing certain tasks have been improved -- the software process is better thought out and better suited to the task than the previous manual process.	
11.	Paper storage is not growing at as fast a pace as it would have without use of the microcomputer.	
12.	Paper storage is actually less than before microcomputer use began.	
13.	Sharing of information among officers and employees has increased.	X

Table 12 (continued).

Possible positive effects	Effects experienced by Pierrepont
14. Better information is made available for decision-making (more detailed financial reports to town board).	X
15. Decision-makers expect more and better information.	X
16. Work is completed on a more timely basis.	
17. The appearance of documents has been improved (true for reports, but not for letters, since printing is not as good as typing previously done on IBM Selectric typewriter).	X
18. The principal microcomputer operator has learned new skills.	X
19. The principal operator feels more positive about his job (less tedium and the opportunity to do more detailed financial analyses).	X
20. One or more officers or employees often are asked to assist less skilled microcomputer users -- and consider this a positive effect.[a]	
21 Other positive effects: (none identified).	

[a] The supervisor's clerk is asked to do this for an average of 20 to 30 minutes weekly, but he does not consider it either a positive or negative effect. It is simply a task that he performs because he has taken the lead in learning to use the microcomputer.

Table 13. NEGATIVE EFFECTS OF MICROCOMPUTER USE IN THE TOWN OF PIERREPONT

Possible negative effects	Effects experienced by Pierrepont
1. Workloads increased significantly during conversion to use of the microcomputer.	X
If so, existing personnel handled this increased workload (for two months, time commitment of supervisor's clerk doubled from previous level).	X
If so, temporary personnel were added during the conversion period.	
2. Workloads increased permanently.	
3. Job frustration increased temporarily for those learning to operate the microcomputer and/or implement its use.	
4. Microcomputer operators are more frustrated with their jobs than before -- even after the initial learning period and/or implementation period.	
5. Job pressures and stress increased for microcomputer operators.	
6. Work became more difficult for microcomputer operators.	
7. Work became less enjoyable for microcomputer operators.	
8. Serious disagreements among microcomputer operators have developed over amount of time spent working on the microcomputer, when it is available for use, location, etc.	
9. Microcomputer operators complain about physical problems resulting from microcomputer use -- eye strain, backaches, etc.	

Table 13 (continued).

Possible negative effects	Effects experienced by Pierrepont
10. Incorrect information occasionally has been produced and used for decisions (the computer tends to lull operator into less checking of data).	X
11. A lower volume of work is produced.	
12. Work is often completed on a less timely basis than it was with manual methods.	
13. Costs have increased; productivity has not increased proportionately.	
14. The microcomputer saves time, but the time saved is not used to benefit the jurisdiction -- employees have more "slack" time.	
15. Revenues decreased.	
16. One or more officers or employees developed serious and persisting cases of computerphobia -- serious anxiety about or fear of using the computer, refusal to use it, etc.	
17. One or more employees quit or retired because of the microcomputer.	
18. The quality of some documents has decreased (computer printer produces lower-quality letters than the IBM Selectric typewriter because it has not been possible to print in the letter-quality mode).	X
19. There is serious and unnecessary duplication of paper files and computer files.	

Table 13 (continued).

Possible negative effects	Effects experienced by Pierrepont
20. There is less capability to provide personalized service to residents.	
21. Officers and employees were forced to learn to operate the microcomputer and still resent this.	
22. One or more officers or employees often are asked to assist less skilled microcomputer users -- and consider this a negative effect.[a]/	
23. Other negative effects: Similar to many other town decisions, the purchase of the microcomputer has resulted in criticism from some town residents who concluded that it was not a wise use of town monies. Some detailed knowledge of certain aspects of town operations is lost when tasks are done by computer.	X

[a]/ See the note to Table 12.

What has been done to minimize or eliminate the negative effects indicated in Table 13? The supervisor's clerk has spent considerable time trying to get the computer printer to print in letter-quality mode, but has concluded that this is not possible. Thus, the town plans to replace the printer at some point. He has responded to the critics of the decision to purchase the microcomputer by emphasizing the additional work he has been able to perform and the additional service provided to town residents. This response attracted the interest of a local newspaper reporter and resulted in a newspaper story that also allowed the town officials to "make their case" that the purchase of the microcomputer was justified.

Overall Evaluation

The supervisor's clerk was generally quite satisfied with the town's microcomputer hardware. On a scale of one (very dissatisfied) to five (very satisfied), he chose five for all the hardware except the printer. He chose one for the printer, stating his reasons for this rating were that setting it to communicate properly with the software was very difficult and that, as indicated before, he had been unsuccessful in his efforts to get it to print in the letter-quality mode.

The supervisor's clerk also was generally satisfied with the software products purchased by the town. On the same one-to-five scale, he chose four as a general rating for the software purchased by the town. He noted that the general-ledger software was a good package for small businesses, its intended users, but it was not nearly as suitable for local governments. His attempts to adapt it had not been very successful. He expected that eventually a replacement package would be purchased. Another drawback to his financial-management software products (the general-ledger, payroll, and budget-preparation products) is that they are not "integrated." In other words, data entered into and manipulated with one software product cannot be automatically or semi-automatically transferred into another software product; rather, the data have to be retyped into the second software product. Despite these drawbacks, working with these software products is a "tremendous improvement" over doing the same tasks manually.

The supervisor's clerk also was generally pleased with the programming he had done with general-purpose software products to develop particular applications for the town. These programs have evolved over time from his initial efforts as he has identified ways to improve them and found time to work on them, and he expects that this will continue.

The supervisor's clerk stated that the most important limitation he had experienced in using Pierrepont's microcomputer was his inability to find more software designed for use by small

towns that could be purchased at reasonable prices. He has searched unsuccessfully for affordable software products for maintaining the general ledger, preparing a town's annual financial report, and computerizing various tasks in the town clerk's office.

The supervisor's clerk was asked to choose a statement from among five alternatives to describe the financial and other costs versus the benefits of acquiring, learning to use, and using Pierrepont's microcomputer hardware and software. He was asked whether the benefits were (1) much lower than the costs; (2) significantly lower than the costs; (3) about equal to the costs; (4) significantly greater than the costs; or (5) much greater than the costs. His choice was number four, and he added that he expected it would become number five when it became possible to use the microcomputer to communicate with the county's mainframe computer to maintain the town's real property assessment roll.

In the opinion of the supervisor's clerk, all towns -- no matter what their size -- are quickly approaching the time when they will have to use microcomputers, in good part because this will be the only feasible way to satisfy the ever-heavier reporting burden imposed by the state and federal governments.

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